2019 AERO INDIA
SHOW DAILY
21 February 2019
VAYU
Day 2

Mix and Match: Defence and Civil Aviation together at Yelahanka

The 12th edition of Aero India had both union ministers of defence and civil aviation together for the inaugural ceremony at AFS Yelehanka. They were flanked by the three Service Chiefs, Minister of State for Defence, Chief Minister of Karnataka and the Secretary for Defence Production (*in image above*). At the very start, two minutes of silence were observed in memory of the IAF pilot of the Suryakiran Aerobatic team who lost his life on eve of the Show. Later, in poignant tribute, three fighters of the IAF mounted a 'missing man formation' during the flypast.

While the Defence Minister Ms Nirmala Sitharaman focused on continuing growth of the aviation ecosystem, with Indian private sector companies reaching global standards, the Civil Aviation minister Mr. Suresh Prabhu was exuberant about the increasing air connectivity throughout India, and referred to 'Vision 2040' which would connect "hundreds of small towns". Ms. Sitharaman lauded the increased blending of the public and private sectors to meet the requirements of India's defence forces, and the global market.

Chief of the Naval Staff, Admiral Sunil Lanba reaching out for his copy of the Vayu Show Daily

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India strides the world's economy and politics as an emerging giant, changing the rules of engagement. It has matched its evolving economic and global stature with path-breaking achievements in building its own defence equipment.

Yet, at the core, there is still dependence on technologies sold to India over the years which have never provided a base for building capability. And, there are more offers for technologies, products and platforms that are past their prime and representative of the old ways of air combat.

As aerial warfare is increasingly defined by asymmetric threats, Beyond Visual Range (BVR) missiles and counter-stealth systems, countries seeking global supremacy will deny know-how of mission-critical electronic warfare systems.

Countries seeking strategic dominance will ensure that other air forces have aircraft with slower mission-critical electronic warfare and battlefield decision-making capabilities.

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SAAB

Air Chief Marshal BS Dhanoa, CAS IAF with visitor at the inauguration

General Bipin Rawat, COAS Indian Army at the inaugural

There was a 'sea of white' at the inaugural ceremony, with senior officers of the Indian Navy and Indian Coast Guard resplendent in their ceremonials

The Air Chief from Myanmar was amongst several heads of Air Forces invited for Aero India 2019

Although the participation of various foreign delegations, including several Air Chiefs was evident and there were a score or more CEOs from leading international companies heading for a subsequent conclave, the stands were not full, unlike in past events. The ensuing flypast was impressive and comprised formations of HAL-built aircraft of the Indian Air Force, including the Dhruv, Rudra, LCH and the LUH rotary wing types while the Sukhoi Su-30 MKI and Tejas were impressively displayed, the latter flown by the CO of No. 45 Squadron himself.

A venerable C-47 Dakota flew past followed by 'Golden Oldies' of the IAF including single examples of the MiG-21 and Avro 748. While there were mix formation of HAL types comprising the Dornier 228, Hawki and HTT-40, the 'Sarang' helicopter formation display team did their spectacular bit but the Suryakirans were surely missed.

Dassault's Rafale carried out a thunderous display with its pilot paying tribute to the fallen IAF air warrior. An F-16 of the USAF made a dramatic start to its display and then all was quiet when an Airbus A330 neo made its dignified flyby. The show was over... but wait! For the first time over Indian skies flew a USAF B-52 strategic bomber, which had taken off from far distant Guam, did his flyby and then returned to Guam, a dramatic demonstration of the long range reach of the USAF.

Controp to supply BEL EO/IR systems

Controp Precision Technologies Ltd. has announced that it will supply Bharat Electronics Ltd. (BEL) with EO/IR systems for the Indian Armed Forces. "CONTROP is proud to continue collaborating with Bharat Electronics Ltd. after completing a number of successful projects with them," stated Mr. Ra'anan Shelach, CONTROP's VP of Marketing. "We welcome the opportunity to develop advanced EO systems for India's technology leader. This is another step of our growing presence in India".

Rafale International showcases capabilities

Rafale International is showcasing three Rafale fighters of the French Air Force, one single-seat Rafale C and two two-seat Rafale B. On the Rafale International booth and in addition to the static display, a scale 1:5 Rafale mock up with the Indian colors will pay tribute to the arrival of the aircraft in the Indian Air Force at the end of this year and to the commitment of the team to fulfil the requests of the competition for the acquisition of additional 114 combat aircraft. A scale 1:10 Rafale M mock-up is displayed to present capabilities of the Rafale variant for Navy, as the aircraft is taking part in the tender of 57 aircraft to equip Indian Navy. At last but not at least, a scale 1:10 Mirage 2000 I/TI mock-up is there to salute the success of the upgrade of the Mirage 2000 legendary aircraft of the Indian Air Force.

A holographic illustration of the long history of Dassault Aviation aircraft and India, starting with the Toofani, followed by the Mystere IV, the naval Alize, the Jaguar (manufactured under license by HAL), and the Mirage 2000, is illustrating the strategic partnership maintained between India and France and the relationship of trust initiated in 1953 when India became Dassault Aviation's first export customer. And on a space dedicated to the "Make in India" commitment of Dassault Aviation, the first massive Falcon 2000 cockpit coming out of the Dassault Reliance Aerospace Limited facility at MIHAN, Nagpur, is being showcased before being sent to Dassault Aviation's Falcon final assembly line in France.

Thales launches Engineering Competence Centre in Bengaluru

Thales continues its development in India by announcing the launch of its Global Engineering Competence Centre (ECC) in Bengaluru. The centre aims to accelerate innovation and digital transformation to serve the needs of both the Indian market and the Group›s global objectives. With the ECC, Thales seeks to play a major role in job creation and skill development in India as it targets to hire 3,000 engineers in the next three-five years along with its partners. It is a first-of-its-kind Engineering Competence Centre in India focusing on software and hardware capabilities in the areas of civil as well as defence businesses, serving Thales's global needs. P Satish Menon has been appointed to head this Centre. He brings with him 30 years of expertise in the fields of engineering, R&D, and programme management.

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Mini Harop
Medium-range tactical weapon system

Rotem Light
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Hall B: B2.1, B2.2

IAI
Creating a Difference

Airbus opens pilot and maintenance training centre


A320 Simulator

Airbus has inaugurated a training centre for commercial pilots and maintenance engineers in the National Capital Region of Delhi, as part of its continuing efforts to support the exponential growth of the civil aviation sector in the country. The training centre incorporates an A320 flight simulator for full-flight simulation, along with programmes on aircraft procedure training, computer-based classroom training, and standard pilot transition training, including an 'Upgrade to Command' course aimed at improving skills and maturity of co-pilots as they transition to commandership. "Providing a robust training infrastructure to support our customers' businesses is a priority for us. One pillar of our customer services mission is proximity to the customer, and another one is safety. In that respect, having a training centre located in the country is proof of our commitment towards both," stated Anand E. Stanley, President and Managing Director, Airbus India & South Asia.

Rafael "Rocks" at Yelahanka

Rafael unveiled a new long range stand-off air-to-surface missile at the Show. "Rocks" is an advanced, extended stand-off range air-to-surface missile, which may be used against high value targets, stationary and re-locatable, even in theaters where the enemy employs effective GPS countermeasures. Equipped with either a penetration or blast fragmentation warhead, the missile can destroy above-ground or well-defended underground targets in heavily surface-to-air-defended areas. "Rocks" is launched at a very significant standoff range, well outside of the enemy's air-defence coverage area, and performs a high velocity trajectory towards the target. This minimises the launch aircraft exposure to threats, as well as improves the strike success rate. "Rocks" uses its INS/GPS for midcourse navigation, while homing on to the target is performed by using its EO seeker and advanced image processing algorithms, which ensures hitting targets with great precision, overcoming GPS jamming or denial.

Lockheed Martin Unveils 'F-21' for India, from India!

Lockheed Martin has further emphasised its commitment to India by unveiling the F-21 multi-role fighter for India. Specifically configured for the Indian Air Force, the F-21 provides 'unmatched Make in India opportunities and strengthens India's path to an advanced airpower future. The F-21 addresses the Indian Air Force's unique requirements and integrates India into the world's largest fighter aircraft ecosystem with the world's pre-eminent defence company'. Lockheed Martin and Tata Advanced Systems would produce the F-21 in India, for India. "The F-21 is different, inside and out," stated Dr. Vivek Lall, Vice President of Strategy and Business Development for Lockheed Martin Aeronautics. "The new [F-21] designation highlights our commitment to delivering an advanced, scalable fighter aircraft to the Indian Air Force that also provides unrivalled industrial opportunities and accelerates closer India-US cooperation on advanced technologies."

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AERO INDIA 2019

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TLMAL Delivers 100th C-130J Super Hercules Empennage

Tata Lockheed Martin Aerostructures Limited (TLMAL) recently delivered the 100th C-130J Super Hercules empennage from its manufacturing facility located in Hyderabad, India. The delivery milestone highlights the ongoing success of Lockheed Martin's hallmark Make in India partnership with Tata. TLMAL — a joint venture between Tata Advanced Systems Limited (TASL) and Lockheed Martin Aeronautics — was established in 2010 in Hyderabad. TLMAL 'exemplifies the Make in India goals and has the distinction of being the single global source of C-130J empennage assemblies that are installed on all new Super Hercules aircraft produced in Marietta, Georgia, in the United States', stated company officials.

Empennage assemblies produced by TLMAL include the aircraft's horizontal and vertical stabilisers along with leading edges and tip assemblies. The TLMAL team also previously manufactured sets of C-130J center wing box components, and introduced a new cutting-edge 4,700 square-meter metal-to-metal bonding facility in May 2018. TLMAL currently employs 500 people.

Cyient-BlueBird JV Launches its New UAS

Cyient Solutions & Systems Pvt. Ltd. (CSS), a joint venture between Cyient Ltd. and BlueBird Aero Systems, Israel, has launched its latest offering, the WanderB Vertical Take-Off & Landing (VTOL) Unmanned Aerial System. The WanderB VTOL is an 'exciting and technologically advanced solution' for military, peacekeeping, low-intensity conflict resolution, law enforcement, disaster management, and commercial applications. The WanderB VTOL is an electric mini-UAS specially optimised for covert, "over-the-hill" operations, supporting extensive day and night ISR missions. It combines the advantages of fixed-wing operation with vertical take-off and landing, supporting significant range, endurance and speed. WanderB offers tactical advantage to defence, paramilitary and security forces for real-time critical intelligence gathering and surveillance.

Rafael Places $30 Million Order to ARC

At a ceremony on 20 February 2019 at Yelahanka, Rafael Advanced Defense Systems CEO, Major General (ret.) YoavHar-Even, presented Chief Operations Officer of ASTRA Rafael Comsys Pvt Ltd (ARC), Brigadier Ravi Hariharan with a $30 million purchase order for the manufacture, test-before-integration, and lifecycle support management for a complete set of the BNet Software Defined Radio system for the Indian Air Force. This order is the first contract for ARC, the joint venture between Rafael and India's Astra Microwave Products Ltd.

In 2017, Rafael was awarded a contract to supply the BNet advanced Software-Defined Radios (SDR) to the Indian Air Force (IAF). ARC will manufacture and integrate these advanced radio systems onboard IAF aircraft, allowing for the digital exchange of tactical information. As a force multiplier, the systems will enable IAF pilots to engage the enemy beyond visual range, without being detected by their on-board sensors.

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AIRBUS large-scale presence at Aero India


Airbus A330neo

From flying and static displays of its best-in-class products to showcasing its cutting-edge aerospace services, Airbus has its biggest-ever participation here at Yelahanka.


C295

The centrepiece of the flying display is the A330neo – the latest addition to the leading Airbus widebody family, featuring advanced materials, new optimised wings, composite sharklets and "highly efficient engines that together deliver 25% reduced fuel burn and CO2 emissions." Demonstration flights are also being performed by the new generation tactical airlifter C295 which can perform multi-role operations under all weather conditions.

On static display is Airbus' most versatile twin-engine rotorcraft – the H135 and H145. The H135 is known for its "endurance, compact build, low sound levels, reliability, versatility and cost-competitiveness." The H145 is a member of Airbus' 4-tonne-class twin-engine rotorcraft product range – with designed-in mission capability and flexibility, especially in high and hot operating conditions.

Visitors at the Airbus exhibit (in Hall E 2.8 & 2.10) can witness the company's continued commitment to supporting the growth of India's aviation, defence and space sectors, particularly in the areas of 'Make in India' and 'Startup India'. Aerospace fans can also savour interactive virtual and augmented reality experiences at the Airbus stand.

"Aero India is the jewel in the crown of the world's largest defence and third-largest commercial aviation market," stated Anand E Stanley, President and Managing Director of Airbus India & South Asia. "Airbus' large-scale commitment to the show demonstrates that India is more than a market, it's a core base for us."

On display are scale models of the C295 medium transport aircraft; the A330 MRTT Multi-Role Tanker Transport aircraft; the A400M – the most versatile airlifter currently available; the SES-12 – a geostationary communications satellite and a holographic display of the Hybrid SAR Earth observation radar satellite.

As for helicopters, scale models of the H225M– the military version of Airbus' H225 Super helicopter; the AS565 MBe – the all-weather, multi-role force multiplier; along with the H135 and H145 are on display. Commercial aircraft scale models include A330-900, the member of Airbus' A330neo new generation widebody, the A321neo and ATR 72-600.

Airbus is also show casing a wide range of service offerings, including through its fully owned subsidiaries Satair and Navblue, with particular focus and demonstrations of Skywise-based digital services. Also, on display is the Airbus' Advanced Inspection Drone which accelerates and facilitates visual checks, considerably reducing aircraft downtime and increasing the quality of inspection reports.

"It is Airbus' firm belief that technology and talent are the key to unlocking the enormous potential of the region." In India, it has sought to foster innovation and entrepreneurial spirit through Airbus BizLab, who are present at Hall E 2.9. Visitors can get a first glance of the opportunities that the startup accelerator has created in the Indian innovation ecosystem. Airbus Bizlab will also partner with Invest India to organise the 'Startup Day' at Aero India.

Airbus is also leveraging the event to acquire talent. On February 23 and 24, it will offer members of the public the opportunity to explore career prospects with Airbus India in Avionics Software, Aircraft System Simulation and Airframe Structures as well as in API Development, Full Stack Development, Big Data, Cloud and DevOps.


H225M


The Panther

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Maritime Harop

IAI's family of loitering attack systems

In the rapidly changing battlefield of the 21st century, an ability to detect and rapidly strike at time-sensitive targets has become one of the most important aspects of combat success. This ability is more relevant than ever, when the adversary is an asymmetric actor hiding in an urban arena, or military targets on the move. Precise, rapid, pinpoint strikes are needed in modern warfare, with an emphasis on reducing collateral damage as much as possible. More than thirty five years ago, Israel Aerospace Industries (IAI) began developing a family of loitering attack systems, by connecting its missile abilities with drone designs.

The result was a series of products that gives operators the ability to strike pinpoint, time critical targets, the kind of ability that is becoming ever-more relevant in the rapidly changing battlefield.

"Like a hunter or a sniper that metaphorically waits for the target to appear, this is the idea behind our guided munition systems," a senior IAI company official said. "The world is moving towards a new kind of battlefield, which is becoming more complex in the asymmetric and symmetric spheres. This can be seen in both types of combat," he stated. When IAI began developing its loitering munitions, it already had fire-and-forget missiles that were fully autonomous, but an operational challenge arose when operators were not certain about the location of targets. The first system to address this gap is the Harpy, a platform which, according to IAI, laid down the foundation for all of its loitering munitions.

The Harpy is a fire-and-forget autonomous weapon that is launched from a ground vehicle behind the battle zone. It detects, attacks, and destroys enemy radar emitters with high accuracy, suppressing hostile SAM and radar sites for long durations, and loitering over enemy territory for hours. It is currently operational with several air forces around the world. "Its advantage is that it knows how to deal with changing situations while in the air," an IAI source said. "When we developed the next member of the loitering munition family, the Harop, it inherited these features. The big difference is the replacement of Harpy's radiation seeker with the Harop's electro-optical seeker, and the insertion of a human operator in the attack loop, thereby greatly avoiding collateral damage," he added.

The human operator dictates the critical order of steps, such as deciding when to attack and when to abort. The Harop also conducts its own automatic processes during this time.

The Harop and Harpy evolved into two groups of products that have since undergone a series of upgrades. Neither is dependent on outside intelligence, and their flight ranges have been extended to up 200 kilometres, together with an ability to fly for up to nine hours over targets.

The Harop can target mobile targets as they appear – a crucial ability in the battlefield of today - and tomorrow. In recent years, the systems' propulsion systems, sensors, computer systems, end electronics have all experienced upgrades. The platforms are also more aerodynamic

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than in the past, and more energy efficient. They employ navigational systems that rely on both internal and external systems, meaning there is no dependence on just one kind of navigation. The systems can deliver strike solutions for ground forces, navies and the air force.

Tactical loitering attack systems

In the lighter-weight section of IAI's loitering munition family, the company has developed a miniature version of the Harop, known as mini Harop. This tactical, low-cost loitering munition is designed for small ground units and special operations forces, delivering high situational awareness and firepower in a compact platform. The Mini Harop is stored, transported, and launched from a sealed canister, and one small vehicle can move as many as 16 units. It is operated from a tablet-sized control panel and equipped with high quality day/night electro-optical guidance systems, enabling it to collect visual intelligence at range of up to 50 kilometres. It is powered by a battery-powered electric motor with a flight time of up two hours. There is also a miniature version of the Harpy, for radiation-seeking anti-radar missions.

The smallest member of this family is the Rotem, a tactical loitering munition that is named after the Hebrew acronym of the words 'suicide attack drone.' This multi-rotor platform, whose design is influenced by commercial drones, delivers low signature strikes on enemy targets in urban and complex battle arenas, and can be deployed in under one minute by a single soldier. The Rotem can hover for up to 45 minutes, and dive at a speed of up to 50 knots. It is able to conduct both reconnaissance and lethal precision strike missions, depending on its payloads, striking targets that are stationary or on the move.

Rotem

Rosoboronexport promotes new series of Kalashnikov assault rifles

Rosoboronexport, part of the Rostec State Corporation, has launched a global marketing campaign to promote the AK200 series of legendary Kalashnikov assault rifles manufactured by the Kalashnikov Concern. "Export permits for the newest Kalashnikov AK200 series assault rifles have been obtained. From now on, Rosoboronexport may offer its partners the AK200, AK203, AK204 and AK205 versions" stated Rosoboronexport Director General Alexander Mikheev.

The AK200 series rifles have retained all the advantages of the traditional AK pattern: reliability, durability and ease of maintenance. The rifle is equipped with integral Picatinny rail and can be fitted with necessary detachable equipment for the effective use of the weapon in various conditions, including in reduced visibility. The length-adjustable buttplate and a number of ergonomic solutions for optimising controls enable operators to fully realise their shooting skills, regardless of their anthropometric indicators and the availability of a variety of personal clothing, gear and equipment. The AK200 series has 'successfully passed the testing programme, meets all the requirements for modern small arms and is an effective small arms system'.

RUSSIAN DEFENCE EXPORT
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Rostec

AK-203

NAMMO: "Over half a century of excellence"

More than 50 years after replacing the original World War II bazooka, its advanced successor, the M72 LAW is now used around the world, giving infantry soldiers the advantage. The M72 Light Assault Weapon (LAW) marked its 50th anniversary of production at Nammo Raufoss, Norway, in 2016. The M72 family has a rich and successful history, owed to its lightweight, robust design and intuitive operation system. Although the LAW started out as the successor to the erstwhile World War II bazooka, continuous developments with new and innovative technologies have kept the M72 family ready for current operations. Recent variants include two new Anti-Structure Munition (ASM) models: the M72A9 ASM and M72 ASM Reduced Calibre (ASM RC), designed to breach buildings and walls with and without fragmentation, respectively.

Perhaps the greatest development is the Fire From Enclosure (FFE) propulsion technology, allowing gunners to safely engage targets from confined spaces, such as inside buildings. This revolutionary enhancement removes the rocket motor from the weapon and uses Davis Gun propulsion principles to launch the projectile, resulting in a dramatic reduction in noise, back blast effects and launch signature. As the M72 FFE enters qualification, other development projects continue, including the M72 Airburst, M72 Fragmentation and fuzing improvements.

After decades of management by a consortium of companies, the M72 family is now owned entirely by the Nammo Group, and has been since 2007. Nammo is dedicated to the continued success and development of the M72 family; and plays a prominent role in the Shoulder Fired Systems (SFS) Business Unit, which was created as part of Nammo's new corporate organisation structure in 2016. Continued development and system improvements for the M72 family are implemented at the two centres of excellence in Raufoss, Norway, and Mesa, Arizona. Close collaboration between the sites, increases the development capacity and eliminates any project overlaps. The renowned role of M72 in the SFS Business Unit exemplifies the 'One Nammo' spirit, as this international team works together to deliver a superior combat-enabling solution.

Test firing of the M-72 FFE, with the counter mass being ejected from the back, absorbing the back blast

M72 Fire from enclosure (FFE)

As the M72 enters its next 50 years, one thing is certain: with outstanding capabilities, modern fuzing and high-performance warheads, the future is brighter than ever. Teamwork, leadership, dedication and commitment are the hallmarks of the Nammo M72 team that continues to improve and deliver the very best M72 solutions to users around the world.

Courtesy: NAMMO

MBDA at Aero India 2019 (Part 1)

The Meteor, Brimstone and Storm Shadow

MBDA is exhibiting a full range of missiles and missile systems at **Stand AB.2.23,** designed to provide next generation air combat capabilities, including air dominance, strike and maritime engagement for the Indian Air Force.

Aero India 2019 is also the first Air Show where L&T MBDA Missile Systems Ltd, the joint venture with Larsen & Toubro, are exhibiting. L&T MBDA Missile Systems Ltd being at **Stand AB.2.24.**

Air dominance weapons on display include:

METEOR is MBDA's ramjet powered and network-enabled beyond visual range air-to-air missile, which is widely recognised as a game changer for air combat. Key to this is Meteor's throttleable ramjet engine, active radar seeker and datalink that combine to provide unmatched end-game speed and manoeuvrability at greatly extended ranges, resulting in its all-important 'No-Escape Zone' being several times greater than any other existing or planned BVR weapons.

ASRAAM is being delivered to the IAF for its New Generation Close Combat Missile programme. With its large rocket motor, and clean aerodynamic design, ASRAAM has unrivalled speed and resultant aerodynamic manoeuvrability and range. ASRAAM will arm the IAF's upgraded Jaguar fleet, and potentially other IAF platforms.

MICA is being delivered for the IAF's Mirage 2000 upgrade and for Rafale. Showcased on MBDA's stand, this is the only missile in the world featuring two interoperable seekers (active radar and imaging infrared) to cover the spectrum from close-in dogfight to long beyond visual range.

MISTRAL ATAM has been delivered to India to equip the HAL weaponised version of the Advanced Light Helicopter, the ALH Rudra. The system is based on two launchers each deploying two MBDA air-to-air Mistral missiles. The same system has successfully undergone integration on the LCH platform, also manufactured by HAL.

BRIMSTONE goes from strength to strength with trials and combat deployment clearly demonstrating the unmatched capabilities of this weapon in meeting the operational challenges of today. Trials have included firing at targets moving at speeds of up to 70 mph from a variety of launch conditions, including long range and high off-boresight. Test scenarios have also simulated a cluttered road environment, as typically encountered during recent conflicts. Every shot achieved a direct hit on the target.

Deep strike is a major requirement for a modern air force. The ability to deliver precision strike against high value targets such as well protected control bunkers/centres, key infrastructures and military installations from a safe stand-off distance is crucial in the early days of a conflict as was shown in Iraq and Libya. At Aero India 2019, MBDA is displaying SCALP/STORM SHADOW which is in operational service on the French Air Force's Rafale aircraft (as well as with other Air Forces) and which has proved its unerring and unmatched ability to combine very long range with devastating target effect during combat operations carried out by the air forces of the UK, France and Italy.

SMARTGLIDER is another long-range strike weapon and is optimised to counter anti-access strategies and other emerging battlespace threats. It forms a family of all-up-round glide weapons, with folding wings and a range of over 100 km allowing the combat platform to stay at safe distance from the enemy defences. With the smallest member of the SmartGlider family being just 120 kg, a Rafale will be able to carry as many as 18 – allowing the destruction of multiple targets or the saturation of even the most complex air defence systems.

(Cont'd in Show Daily Day 3, 22 Feb 2019)

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Irkut Yak-130s proliferate in South East Asia

Yak-130 combat trainer of the Laotian Air Force

Yak-130 combat training aircraft produced by Irkut Corporation of Russia, are being ordered in large numbers by operators in South East Asia, the latest deliveries being made in January 2019 to the Laotian Air Force. The Yak-130s will substantially add to the strength of this air arm, and prepare pilots to fly further advanced aircraft in the future, the Yak-130s themselves able to perform a wide range of combat mission.

Laos has became the third country in Southeast Asia to procure Yak-130s, following the Air Forces of Bangladesh and Myanmar. It is understood that Myanmar has in 2016 received another batch of six Yak-130 aircraft from Russia, taking their number to 12 units.

The Russian Aerospace Force presently maintain the largest inventory of Yak-130s, some 110 numbers. As Colonel Sergei Evdokimov, Chief of Staff of the Krasnodar Military Pilot School, puts it : "The Yak-130 is a versatile aircraft for training of pilots, starting from basic and continuing for combat training as also for honing flying skills of instructors." The Yak-130 is equipped with advanced simulation systems, enabling it to be employed for realistic air combat and ground attack training without using actual ammunition. In addition to Russia, the Yak-130 has been chosen by Algeria and Belarus as their aircraft for combat air training.

However, unlike Russia, which uses the Yak-130 for advanced training aircraft, Belarus is employing this type for combat duties. At the recent *Aviadarts*-2018 international air exercise, the Belarusian Yak-130s were placed as second in the category of 'attack aircraft', most well-ahead of most specialised attack aircraft types. The Yak-130 has a warload of upto 3,000 kg, including both guided and free fall munitions for air-to-ground and air-to-air combat missions. The Belarusian Air Force presently has eight Yak-130s, with four more on order. Interestingly, Belarus not only orders aircraft, but also participates in programmes to enhance combat capabilities, including the installation of an ESC Talisman-NT system on the Yak-130.

With some 170 delivered so far, the Yak-130 is ahead of other new-generation subsonic jet training aircraft, including the Italian M-346. One of the reasons for this is that the Yak-130 offered is an integrated system of training including free flight ground training with specialised simulators. Also part of the training package is the Yak-152, a piston engine aircraft for primary training which is more than just a trainer for civilian flying training or for sports.

Such an integrated flying training scheme offered by a single manufacture is unique, not only providing high quality of training but at minimal cost of acquisition and operation.

Yak-152 piston trainer

MULTI-ROLE COMBAT-PROVEN BUILT FOR THE FUTURE

As the most advanced and lowest-cost fighter per flight hour, the F/A-18 Super Hornet will deliver next-gen superiority and survivability to India. By assembling, testing and certifying this aircraft at a state-of-the-art Factory of the Future in India, Boeing will help grow the country's aerospace ecosystem. And with a plan for growth, the F/A-18 Super Hornet will continue to outpace threats—and make India stronger.

BOEING

Elettronica Group and its EuroDIRQM

Elettronica Group and Indra have teamed up for development of a next generation Quantum Cascade Laser (QCL) based Direct Infrared Countermeasure (DIRCM) system for protection of rotary and fixed wing aircraft. Elettronica and Indra's plans are based on high level of the respective know-how and technological capabilities synergy with the aim to build an innovative DIRCM system, with proprietary technologies from several EU countries, to deliver a 'truly European self-protection solution fully ITAR-free to facilitate international commercialisation'. The system, first to be fully developed in Europe and one of the most advanced in the market, has been dubbed EuroDIRQM, to reflect its European roots and its application of QCL technology for DIRCM purposes.

The two companies have already completed development of a first EuroDIRQM prototype system, with QCL operational ground tests successfully performed last year, with cooperation of the Italian Air Force. The EuroDIRQM is conceived as "all-in-one" equipment usable for multi-platform and multi-mission that will provide self-protection capabilities to all kind of aircraft, from helicopters to transport/tanker to fighter aircraft.

The EuroDIRQM solution will bring together about 30 years of combined experience in the DIRCM field by the two companies and the collaboration will benefit from their long term cooperation in other international successful programmes. Indra and Elettronica have successfully applied their DIRCM capabilities on different platforms and scenarios. The new QCL technology will expand Indra DIRCM capabilities, already consolidated with the InShield DIRCM system, contracted by OCCAR for the A400M fleet and operationally demonstrated in a CH-47 Chinook in 2017. In the same way, Elettronica DIRCM portfolio, with the ELT/572 DIRCM, contracted by Italian Air Force and operative on-board its C-130J aircraft, AW101 helicopters in Combat Search And Rescue configuration as well as operationally demonstrated in a C-27J in 2016, will also be enlarged with this QCL based solution.

MANPADS (Man Portable Air Defence Systems) are surface to air missiles, guided towards the heat generated by aircraft, and can be easily managed by one single operator. These devices are the main cause of military aircraft losses in conflict. MANPADS pose an international threat and a global concern because of their proliferation and use by terrorist and uncontrolled groups.

DIRCM systems are self-protection airborne solutions to protect aircraft from heat-seeking missiles and are specially required for protection against MANPADS missile attacks. The concept is based on detection of the incoming threat during missile launch and countermeasures of the missile guidance using a directed laser beam that deviates trajectory of the missile. The process is quick and automatic, and the system reacts against attacks of any IR seeker with a jamming sequence that ensures successful countermeasures.

Elettronica Group has been on the cutting edge of electronic warfare for more than 60 years, supplying armed forces and governments of some 30 countries with more than 3000 high technology systems. Privately controlled by Benigni's family, with Leonardo and Thales as shareholders, the Group is composed of three industrial assets: Elettronica S.p.A, the headquarters, based in Rome, leader in EW capabilities, CY4GATE, a joint venture with Expert System, specialising in Cyber EW, Cyber Security and Intelligence, and Elettronica Gmbh, the German subsidiary specialising in EW signal processing design and production and Homeland Security solutions. Elettronica's systems are deployed for a variety of key operational missions, from strategic surveillance, to self protection, SIGINT, electronic attack and operational support for airborne, naval and ground applications. The Elettronica Group boasts a strong record of successful domestic and international collaborations on key modern military platforms such as the Italian PPA, the Eurofighter Typhoon, the NFH-90 helicopter, various Italian and French warships Horizon and FREMM, and a wide range of applications in the Gulf, Middle East and Asia.

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UAC: "More than 43,600 new Civil Aircraft will be sold until 2037"

UAC has presented its annual Market Outlook for the next 20 years. According to the forecast, it is estimate estimated that the total demand for new passenger aircraft beyond 30 seats in 2018-2037 will exceed 43,600 aircraft "worth over US$6 trillion" .

The market outlook is a comprehensive marketing analysis devoted to the world's civil aircraft segment that analyses tendencies and trends in the development of commercial air transportation in the world. Most attention is devoted to the passenger transportation segment both in terms of value and delivery numbers. This segment is very important to UAC as, according to the Corporation's long-term development strategy, UAC's revenue from sales of commercial aircraft should reach 45% of total sales, outgrowing other revenue segments.

UAC President Yury Slyusar stated that "The innovative development of this industrial model, increasing production rates of narrow- and wide- body aircraft are paving the way to new market segmentation. The changing competition conditions are leading to further fleet optimisation, adjustment of air transportation models, and demand for new civil aircraft in general".

Aeroflot and UAC in agreement for 100 Superjet 100s

Aeroflot and the United Aircraft Corporation have signed an agreement for 100 Superjet 100 (SSJ100) aircraft. The document was signed by Aeroflot CEO Vitaly Saveliev and UAC President Yury Slyusar during the Eastern Economic Forum in the presence of President of the Russian Federation Vladimir Putin. Under the agreement UAC will deliver 100 SSJ100 aircraft to Aeroflot between 2019 and 2026. The aircraft will be configured with 12 seats in business class and 75 seats in economy class. The final contract documents will be signed after the parties agree on material terms of the transaction and obtain necessary corporate approvals.

Yury Slyusar, President of PJSC UAC said, "We have worked with Aeroflot for many years. As the first and largest operator of SSJ100 aircraft, Aeroflot has significantly helped the development of Russia's aircraft industry. The signing of the new agreement marks the next stage of our cooperation and joint contribution to the development of the aircraft industry and the expansion of regional and international air connections. We are happy to continue working with Russia's leading airline."

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"The BrahMos is an ideal example of military cooperation"

Russia's Tactical Missiles Corporation considers the Russian-Indian BrahMos project as "an ideal example of military and technical cooperation", CEO Boris Obnosov recently stated. "This is one of the examples of military and technical cooperation between the two countries, which is effective and useful for both states." Speaking about the prospects of selling BrahMos missiles to third countries, the chief executive noted that such an issue was "being considered by the Tactical Missiles Corporation" but declined to disclose any details.

The PJ-10 BrahMos is a supersonic cruise missile with a solid propellant booster. The missile being was developed by the Research and Production Association of Machine-Building in the town of Reutov near Moscow

and India's Defence Research and Development Organisation (DRDO), the missile a modification of the Soviet anti-ship missile developed by the Reutov design bureau in the late 1980s. The BrahMos was developed in the late 1990s pursuant to an agreement between the governments of Russia and India signed on 12 February 1998.

The project's name was derived from names of India's Brahmaputra and Russia's Moskva rivers. The first test launch was conducted on 12 June 2001 at the Chandipur range in the state of Odisha, India. The missile's production is ongoing at enterprises both in Russia and India.

"Speeding up LCA deliveries"

VAYU Interview with R Madhavan, CMD HAL Part-II

VAYU : HAL launched two engine development programmes during its Platinum Jubilee year, a 25 kN engine for trainer aircraft and a 1200 kW turbo shaft engine for helicopters. The Defence Minister commissioned trial runs of one of the engines, to demonstrate progress. How are these twin projects doing? What is the future for them?

HAL : HAL has taken up the design and development of the following aero engines: the 25 kN turbofan engine is expected to meet this requirement for basic advanced military trainers, small business jets and also for large UAV applications. The core engine has been built and the engine run commenced in December 2015 with 100% rpm achieved. The core 2 engine run was successfully carried out in January 2018. Both the core engines are under testing and so far over 300 engine runs have been successfully completed. Development of this engine will enable the country to achieve self-reliance in design of this class of engines and its technologies, such experience further leveraged to design and develop higher thrust engines for modern fighter aircraft.

HAL is also working on design and development of the 1200 kW turboshaft engine to be used as power plant for three to six-ton category helicopters. The HTSE-1200 engine technology demonstrator was assembled and inaugural test run successfully carried out on 12 February

2018 with 76% rpm achieved. The engine was actually tested at sea level at the DefExpo-2018 site for light up, acceleration and stable running at idle speed. The engine is currently under testing with over 240 successful engine runs completed so far.

VAYU : HAL has undertaken upgradation of the Hawk AJT and has developed a Technology Demonstrator, referred to as Hawk i, first displayed at Aero India 2017 and also dedicated to the Nation by the former Defence Minister. Has HAL marketed this aircraft to the IAF and for export ? What are the plans to promote this aircraft?

HAL : HAL has presented the Hawk Mk.132 avionics upgrade capabilities to the IAF and the Indian Navy. During Aero India 2017, a BAES test pilot flew the aircraft and the Namibian Air Force was given demonstrations. Subsequently, delegations from Sri Lanka and the UAE during their visits to HAL, showed interest in Hawk i's features including the Mission Computer with Digital Map Generation, Embedded Virtual Training Facility, EW systems and new weapons, in addition to other indigenous systems. The feedback received is encouraging.

The new capabilities and continuous developments are being demonstrated regularly to all prospective customers and the aircraft is also planned to be showcased during Aero India 2019.

VAYU : A full-scale mockup of the Indian Multi-Role Helicopter (IMRH) was unveiled during Aero India 2017, as main attraction at the HAL display, which also received favourable reviews. What is status of the project and plans for its development?

HAL : Preliminary design studies of the Indian Multi-Role Helicopter (IMRH) have been completed taking into account requirements of the Indian Armed Services, the IMRH being proposed as an indigenous development project with government funding. Discussions have been held with several Indian Private Industries and various HAL Divisions to maximise indigenous content. Internal studies have been completed and review by the Preliminary Design Review (PDR) committee which includes members from the three Services, CEMILAC and DGAQA have been initiated. This review is to fully understand operational requirements, maintenance, logistics support and upgradation of the helicopters during service life. HAL is looking forward to the next phase of the project after the configuration freeze.

VAYU : The proposed Indian Regional Transport Aircraft (IRTA) is a much talked about subject and Aero India 2009 is an excellent opportunity to review its status. There seems to be hope for the Project with the setting up of a Consortium of HAL, NAL and ADA. A Special Purpose Vehicle (SPV) will take this project forward. Kindly share some details on this project.

HAL : The Ministry of Civil Aviation has proposed development of the Indian Regional Transport Aircraft (70 to 90 seat) to meet requirements, forming a Special Purpose Vehicle (SPV) with participation of stakeholders, being HAL, NAL and ADA. In pursuance of recommendations of the Committee of Secretaries, Ministry of Civil Aviation (MoCA) has constituted a Committee with these stakeholders for creation of such a SPV for development of the IRTA. The committee has proposed initiation of the Project Definition Phase (PDP) by CSIR-NAL, HAL and DRDO-ADA with CSIR-NAL as the lead agency, and parallel setting up of the SPV. The SPV will be a government-funded entity with special administrative and financial powers, which will facilitate execution of the project within the stipulated time frame. The in-principle approval for formation of SPV and development of RTA project will be pursued by the MoCA for submission to the Ministry of Finance (MoF).

VAYU : HAL is considering re-engining of the Avro transport aircraft and also incorporate improvements to extend its service life. Please elaborate on this project.

HAL : The project is under preliminary discussion phase. The upgrade will consist of avionics and engine upgradation.

VAYU : The 'Make in India' initiative has encouraged many large and medium sized private industries to consider moving into the aerospace domain. The concept of SP (Strategic Partners) as also the indirect patronage of the Government could erode the market share of HAL. Recent RFPs for acquisitions have excluded HAL from participating ! What is HAL's reaction and strategy to address this situation in maintaining its pre-eminent position in the field of Aeronautics, which it has enjoyed for close to eight decades ?

HAL : In line with the Government's vision of developing the ecosystem for aerospace and defence (A&D) industry in the country, HAL is committed to develop vendors and suppliers, and also to strengthen the supply chain for the industry. For the past 78 years, the organisation has been supporting the Indian Defence Forces, building trainers, fighters and military transport aircraft, helicopters of various categories and upgrading the fleets. HAL has also supported Indian defence forces in maintaining, repairing and overhauling aircraft built over the decades.

The entry of private players under the 'Strategic Partnership' model and related Government policies will make the industry competitive. HAL believes that healthy competition will be in favour of the industry, to develop vendors and suppliers, build defence capabilities and make the country a defence manufacturing hub. There is always scope of constructive collaboration for mutual benefits !

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The **Hindustan Turboprop Trainer-40** (HTT-40) is an initiative under “Make in India” by HAL with an internal funding support. The indigenous content on HTT-40 is close to 80% and almost 50% of the components on HTT-40 are manufactured by private players of the Indian aerospace ecosystem.

www.hal-india.co.in

Rafael unveils the Spike ER2

Rafael Advanced Defense Systems has revealed its Spike ER2 Fifth Generation Extended Range missile, "to enable Joint 5th generation tactical overmatch for ground manoeuvere, rotary dominance and naval deterrence." The new missile features a number of new capabilities, and a combination of greater standoff range of up to 10 km for surface launch, and 16 km when fired from a helicopter, NLOS engagement capabilities (launch to grid coordinate), "while retaining the Spike legacy of relatively light weight (less than 34kg) and high lethality." These constitute significant factors for precision-guided missiles.

The Spike ER2 has evolved from the wider Spike Missile family, which is "one of the 'most combat-proven missiles'", integrated on more than 45 platforms, in use by 30 nations, with over 30,000 missiles already supplied and 5000 missiles fired. The Spike ER (Extended Range) variant, now upgraded to Spike ER2, is the mid-range member of the family, with a range of 8 km, and has a vast platform portfolio, including on the Spanish Army Aviation Tiger helicopter, the Colombian Air Force Blackhawk, the Italian AW129 Mangusta, the Romanian Super Puma helicopter, the Super Cobra, and various types of ground vehicles and naval vessels.

The missile includes a new RF datalink variant to maximise the missile's energetic range for enhanced stand-off launch from rotary platforms, having a 16 km range. It also integrity a modern advanced seeker with high resolution IR and day sensors for extended range target acquisition, and a multispectral target tracker, enabling sensory data fusion - an important feature in the smoky environment of today's battlefields. The missile also has a special maritime target tracker which can sustain target lock-on in the maritime environment. The Spike ER2 seeker was designed for the modern battle arena enabling 'hotswap' capabilities of sensory swap between IR to day midflight (important for detection of camouflaged targets). In addition, it has network connectivity and Non-Line-Of-Sight (NLOS) engagement capabilities, including an embedded IMU (Inertial Measurement Unit) for third party target allocation, allowing firing of the missile on NLOS grid target coordinates.

"Saab Gripen E is on Track"

Delivery of first series production aircraft in 2019

Part-II

VAYU Interview with Ola Rignell

Chairman and Managing Director, Saab India

VAYU : Saab have been are engaged in supply of electronic warfare (EW) self-protection system for the HAL Dhruv ALH and the same could be integrated with the new light combat helicopter (LCH). Which fixed-wing aircraft types could also be considered for the IDAS?

Ola Rignell : Saab is providing the Integrated Defence Aid Suite (IDAS) for both the Indian Air Force and Army Aviation Corps variants of the Advanced Light Helicopter (ALH), designed and manufactured by Hindustan Aeronautics Limited (HAL). IDAS is a fully integrated multi spectral warning system designed for self-protection of airborne platforms. IDAS combines radar-,laser-and missile approach warning functionality integrated with a countermeasure dispensing (CMD) capability for the deployment of chaff and flare decoys.

On the ALH, IDAS is integrated with an Indian-designed and manufactured CMD system. IDAS is supported by a dedicated mission planning tool known as the Threat Library Management System (TLMS). The supply of IDAS equipment for ALH is currently in full series production. Saab is also providing a comprehensive transfer of technology (ToT) to HAL for in-country maintenance and repair of the IDAS system in India, with the scope of expanding into full production in the near future.

We will reply to request from the Indian Air Force on a case to case basis for fixed wing aircraft but in general our system could be fitted to almost any fixed wing aircraft available today.

VAYU : The Carl-Gustaf antitank rocket system is in widespread use with the Indian Army; is the latest

M4 version being offered for supply and manufacture in India ?

Ola Rignell : The Indian Armed Forces are one of the biggest and most experienced users of the Carl-Gustaf weapon system, and today they are operating the Carl-Gustaf M3 version. Through FFV Ordnance, part of the Saab Group, the Indian Armed Forces has been offered the Carl-Gustaf M4.

Today's dismounted infantry face a broader range of battlefield challenges than ever before. Having a single weapon for all situations increases their tactical flexibility and reduces the amount of equipment that they carry. The new Carl-Gustaf M4 version has all the effectiveness and versatility of the Carl-Gustaf M3 system but its improved, lightweight design (weighing less than 7 kg) offers significant mobility improvements to the soldier. Capabilities much needed for soldiers operating in challenging environments. The M4 enables soldiers to deal with any tactical situation – from neutralising armoured tanks or enemy troops in defilade, to clearing obstacles and engaging enemies in buildings. We have showcased the M4 version to the Indian Army as well and you will be able to see it in our stand during Aero India.

VAYU : What is the interest in India of Saab's Digital Air Traffic Solutions especially for remote airfields which is very pertinent in context light of India's expanding regional air services under the UDAN Scheme.

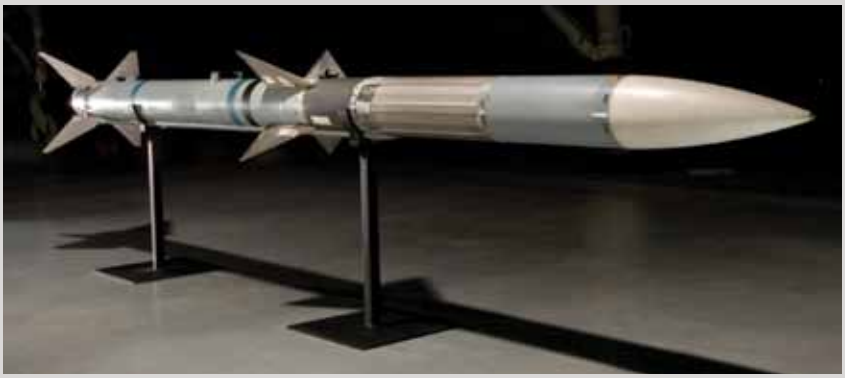
Ola Rignell : Saab and the Airports Authority of India (AAI) have signed a Memorandum of Understanding (MoU) to research a pan-Indian Air Traffic Management Automation System for airports to be included in India's UDAN Regional Connectivity Scheme. The MoU with Saab will support AAI's need for ATM solutions and training of its personnel in ATM services. In addition, Saab is offering its Remote Tower for providing Air Traffic Management Solutions in far flung areas. The Remote Tower product suite includes high-definition cameras and pan-tilt-zoom cameras, surveillance and meteorological sensors, microphones, signal light guns and other devices for deployment at the airport.

VAYU : Kindly give us a preview of Saab's displays at Aero India 2019 and the message the company would like to convey.

Ola Rignell : At the Saab stand, there are dedicated displays and augmented reality exhibits showcasing our key products and systems. We are exhibiting our cutting-edge technologies and capabilities in aviation systems, ground combat systems, electronic warfare and naval systems - solutions that demonstrate our long and successful track record in developing ground-breaking technologies and pioneering innovations. Some of the products on display include Gripen E and Weapons System, Gripen Maritime, Integrated Defence Aids Suite (IDAS), Digital Tower Management Solutions, Ground Combat System, Land Electronic Defence System (LEDS) 50Mk2, Next Generation Radar Systems, including GaN based (Gallium Nitride) Saab AESA Fighter Radar and the truly multi-role Globaleye AEW &C aircraft with ERIEYE-ER radar, GIRAFFE 1X and Saab's portfolio of Signature Management Systems.

Nammo equipping the AMRAAM with its rocket motor

The AMRAAM is the world's most popular beyond-visual-range missile, and more than 14,000 have been produced for the United States Air Force, the United States Navy and 33 international customers. The AMRAAM has been used in several engagements and is credited with many air-to-air kills. In addition to the air-to-air application, it is also used in the NASAMS Air Defence system. The US Company Raytheon is the prime contractor for AMRAAM. Nammo has been qualified as a rocket motor supplier to AMRAAM since 2012, and is now in full rate production for deliveries to this important missile.



AMRAAM has an all-weather, beyond-visual-range (BVR) capability. It improves the aerial combat capabilities of US and allied aircraft to meet the threat of enemy's air-to-air weapons. AMRAAM serves as follow-on to the AIM-7 Sparrow missile series. The new missile is faster, smaller, lighter and has improved capabilities against low-altitude targets.

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Aequs: Ecosystem Advantage in the Aerospace Sector

The Aerospace and Defence industry is recording significant advancements over the past few years, driven by multiple factors such as high demand from consumers in addition to technological disruption. According to a report by Deloitte, backlog on commercial aircraft orders is at its peak at more than 14,000 aircraft, with about 38,000 aircraft expected to be produced globally over the next 20 years. While original equipment manufacturers (OEMs) expect the suppliers to reduce costs and increase the production rate this in turn is putting pressure on the suppliers. This process will continue as the OEMs focus on expanding their margins. Reports also estimate that by 2025, India is expected to become the "third largest" aviation market with some 478 million passengers flying by 2036. It follows that there could be a demand for more than 2000 new aircraft in India over the next two decades, dominated by single-aisle aircraft.

In line with this, there is a dire need for a new paradigm of manufacturing which can be versatile and flexible so as to increase the intensity and pace of manufacturing. Also, with diversification of the customer base and manufacturing facilities, there is need for a robust supply chain to meet these significant demands. To deal with these challenges, manufacturers should focus on ways to strengthen supply chain management, increasing the efficiency and productivity by implementing latest technologies in their facilities.

Supply chain: resourcefulness is critical

The success of any manufacturing supply chain lies in its resourcefulness. Innovative approaches can reduce the manufacturing costs, use available human resources efficiently, and accelerate timely delivery to effectively meet customer requirements. Manufacturing components in isolated facilities in multiple locations has been a tradition in the sector despite the challenges that comes with it, be it higher costs, time consuming processes, coupled with huge waste generation in each of the facilities. This is also a high maintenance business.

There is need to integrate all the facilities in one location and have a strong and progressive ecosystem. This process of amalgamating multiple isolated facilities in manufacturing, eases the communication and efficiency among the parties involved - original equipment manufacturers (OEMs), their suppliers and customers.

The objective of such a system is to create a holistic and integrated aerospace ecosystem which enables customers to meet all their requirements at one place to save time, costs and logistics involved in sourcing from multiple locations. To be specific, this helps in cutting down the huge waste generation, speeding up time to market in the process. This vertical integration also helps in building a better network among the stakeholders involved which, in turn, results in better performance and meeting the customer demands.

While sole-sourcing of suppliers involves risk but is a traditional model, multiple-sourcing minimises the occurrence of supply disruption as there are alternate suppliers to source in case of crisis. Sales and operations unit is implemented in various companies to have better connectivity within the supply chain for better-timed decisions and effectiveness. With inclusion of suppliers from lower-cost countries with reasonable technological capabilities, digital disruptions and adoption of newer technologies are leading to a major change in the supply chain management in the sector, driving the adoption of an integrated manufacturing ecosystem.

The way forward

With changes across the sector, there also comes a need to constantly upgrade the workforce with required technical skills and digital knowledge. As more facilities are incorporated to create a modular ecosystem with all the components and their benefits at hand, the challenges are

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Aravind Melligeri, Chairman & CEO, Aequs which is one of the fastest growing global aerospace manufacturing ecosystem, headquartered in the Aequs Special Economic Zone in Belagavi (Belgaum) in Karnataka state

being addressed with the adoption of newer technologies. We foresee the industry moving towards embracing the integrated manufacturing ecosystem model, quickly adopting to newer technological changes to stay agile. This will lead to a quantum jump in efficiency and productivity.

The aerospace industry is entering an era of boundless possibilities and the outlook is positive for all stakeholders involved. As OEMs and the suppliers work to reduce costs and move closer to customers, emerging markets can leverage the same to bring in investments, create quality employment opportunities and meet the needs of their domestic aviation and defence sectors. India's emerging aerospace industry is witnessing the advantages of an integrated ecosystem in states like Karnataka and Telangana, setting an example for other players in the market to identify and adopt this trend. Favorable geopolitical situation and policy amendments are key to the growth of such agile ecosystems and the country has already set its course in that direction.

The bold moves made by private players, together with the government's support to encourage such moves and provide timely access to funds and resources, are taking this sector to new heights in India.

Airbus and Dassault Systèmes in strategic partnership

AIRBUS

DASSAULT SYSTEMES

Airbus and Dassault Systèmes have signed a five-year Memorandum of Agreement (MOA) to cooperate on the implementation of collaborative 3D design, engineering, manufacturing, simulation and intelligence applications. This will enable Airbus to take a major step forward in its digital transformation and lay the foundation for a new European industrial ecosystem in aviation.

Under the MOA, Airbus will deploy Dassault Systèmes' 3DEXPERIENCE platform, which delivers digital continuity, from design to operations, in a single data model for a unified user experience, making digital design, manufacturing and services (DDMS) a company-wide reality for all Airbus divisions and product lines.

DDMS paves the way for breakthroughs in new product design, operational performance, support and maintenance, customer satisfaction and new business models, as it represents a move from sequential to parallel development processes. Instead of first focusing on product performance, Airbus will be able to co-design and develop the next generation of aircraft with the manufacturing facilities that will produce them, reducing costs and time to market.

"We are not just talking about digitalisation or a 3D experience, we are rethinking the way aircraft are designed and operated, streamlining and speeding up our processes with customer satisfaction in mind." said Guillaume Faury, President Airbus Commercial Aircraft. "DDMS is a catalyst for change and with it we are building a new model for the European aerospace industry with state of the art technology. Our target is a robust production setup that offers a reduction in product development lead time."

"Nothing exemplifies the intersection of technology, science and art more than aviation. When we reflect on how the industry has evolved to where it is today, it's a blend of technical prowess, digital precision and inspiration," said Bernard Charlès, Vice Chairman and CEO, Dassault Systèmes. "The Aerospace industry has a proven track record of fast transformation, faster than in most industries. It delivers high quality innovation and new services for operations in highly complex and regulated environments. The 3DEXPERIENCE platform will accelerate the digital transformation of Airbus. Airbus can capture insights and expertise from across its ecosystem to deliver new experiences that only the digital world makes possible."

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SECURING THE FUTURE

Rolls-Royce showcases technology prowess and India partnership

Rolls-Royce is showcasing its India partnership and technological prowess at Aero India 2019 at Yelahanka. Located at the UK Pavilion, in Hall A, Rolls-Royce is demonstrating its support of current programmes and future opportunities in India.

Rolls-Royce has been steadily building its capabilities in India, across engineering, manufacturing, supply chain, digital and customer support to support local growth. The Aerospace Engineering Centre in Bangalore has over more than engineers contributing to global aerospace engine programmes. Rolls-Royce's R^2 Data Labs, an acceleration hub for data innovation with a facility in Bangalore, develops data applications that unlock design, manufacturing and operational efficiencies and creates new service propositions for customers.

"Rolls-Royce is proud of its 80-year relationship with the Indian Armed Forces. With India's focus on modernisation and indigenisation of its Armed Forces, Rolls-Royce is committed to sharing innovation, capability and knowledge through its enduring and cooperative partnerships."

Pankaj Kaushik, Vice President India (Armed Forces & Govt.), Rolls-Royce – India & South Asia, stated, "As India continues to develop its capabilities in aviation industry, Rolls-Royce believes that this is the right time to step up discussions on its products and technology and fully participate in the evolving sector in the country. Aero India 2019 offers a platform to present our full range of power and solutions for aviation to support the growth needs of the industry. As a leading industrial technology company, we continue to expand our presence strategically, through collaborations with companies like Hindustan Aeronautics Limited (HAL), TCS, and QuEST. We are committed to further strengthening our partnerships, to enable India to benefit from our innovative products, solutions and technologies. In line with our vision to pioneer the power that matters to our customers, we are well-positioned to offer our strong portfolio of more efficient and cleaner products and solutions and play a key role in India's growing aviation sector."

The RR Adour Mk811 engine powers the Jaguar strike aircraft

The Rolls-Royce Adour Mk871 powers the IAF Hawk advanced jet trainer

Louise Donaghey, SVP India and South Asia, Rolls-Royce, stated, "Rolls-Royce has had a long and distinguished history in India since 1932. With India's focus on strong economic and infrastructure growth, Rolls-Royce is well positioned with its broad range of products and services to meet the needs of our customers and help India achieve its long-term growth vision. We are part of India's future as a centre for innovation and manufacturing. We are proud to be a leading provider of power to the Indian Armed Forces, and our commitment to support India to achieve its goals of indigenisation and self-reliance remains as strong as ever."

Rolls-Royce has been working closely to ensure that India is uniquely placed to support both its future requirements and the development of advanced technological solutions across global markets. "Rolls-Royce pioneers cutting-edge technologies that deliver the cleanest, safest and most competitive solutions to meet our planet's vital power needs."

Rolls-Royce has customers in more than 150 countries, comprising more than 400 airlines and leasing customers, 160 armed forces, 4,000 marine customers including 70 navies, and more than 5,000 power and nuclear customers. The company employs almost 50,000 people in 50 countries. More than 16,500 of these are engineers.

Mr. Kishore Jayaraman, President, Rolls-Royce, India & South Asia

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"Unmatched & Undefeated": The Boeing F/A-18 Super Hornet

Boeing test pilot Steve 'Bull' Schmidt is a calm, cool and collected man, traits that serve him well on the job. Several times per month he flies fighter jets, just off the production line, to determine if the new aircraft can safely do what they were designed to before the military customer takes delivery.

"Flying the F/A-18 Super Hornet is the culmination of a lot of work that happens beforehand," Schmidt said. "The engineers and mechanics on the floor are the ones who put it all together, so the high quality is really a reflection of their efforts and the team overall."

Schmidt has flown more than 400 production first flights in his career, including the T-45, F-15, T-X and F/A-18. The next jet to be added to Schmidt's extensive aviation resume? The Block III Super Hornet.

"I'm really excited to see what the next-generation Super Hornet can do," he said. "As a pilot, I'm most looking forward to seeing how the conformal fuel tanks and advanced cockpit system operate in the skies. Those two capabilities are game-changers for U.S. Navy pilots."

The Block III configuration adds capability upgrades that include enhanced network capability, longer range, reduced radar signature, an advanced cockpit system and an enhanced communication system. The fighter's life also will be extended from 6,000 hours to 10,000 hours.

Schmidt began flying the F-14 in 1984 for the U.S. Navy. He retired from the Navy after 20 years, which included completion of the Naval Test Pilot School and Naval Fighter Weapons School, or Top Gun. Between the military and Boeing, Schmidt says he's been flying continuously for 30 years, but still relishes his profession.

F/A-18 Super Hornet: Key facts and milestones

- The Super Hornet has proven to be the most cost-effective aircraft in the U.S. tactical aviation fleet, costing less per flight hour to operate than any other tactical aircraft, including the F-16.
- Two highly reliable General Electric F414-GE-400 engines power the Super Hornet, producing a combined 44,000 pounds of thrust.
- The Super Hornet has 11 weapons stations, giving it extraordinary payload flexibility.
- It can carry more than 400 configurations of air-to-air and air-to-ground ordnance.
- The first operational F/A-18E/F Super Hornet squadron formed in June 2001 and deployed into combat aboard the USS Abraham Lincoln (CVN 72) in July 2002.
- In April 2005, Boeing delivered the first Block II Super Hornet
- The Commonwealth of Australia ordered 24 F/A-18F Super Hornets in 2007, becoming the first international Super Hornet customer.
- Since inception, the Super Hornet program has remained on time and on cost.
- The current US Navy Super Hornet Program of record is 568 aircraft.
- In August 2013, Boeing and Northrop Grumman conducted flight tests with a prototype of an Advanced Super Hornet aircraft with conformal fuel tanks, an enclosed weapons pod and signature enhancements.
- In June 2014, Australia announced plans to acquire 12 new EA-18 Growlers, the airborne electronic attack derivative of the Super Hornet.

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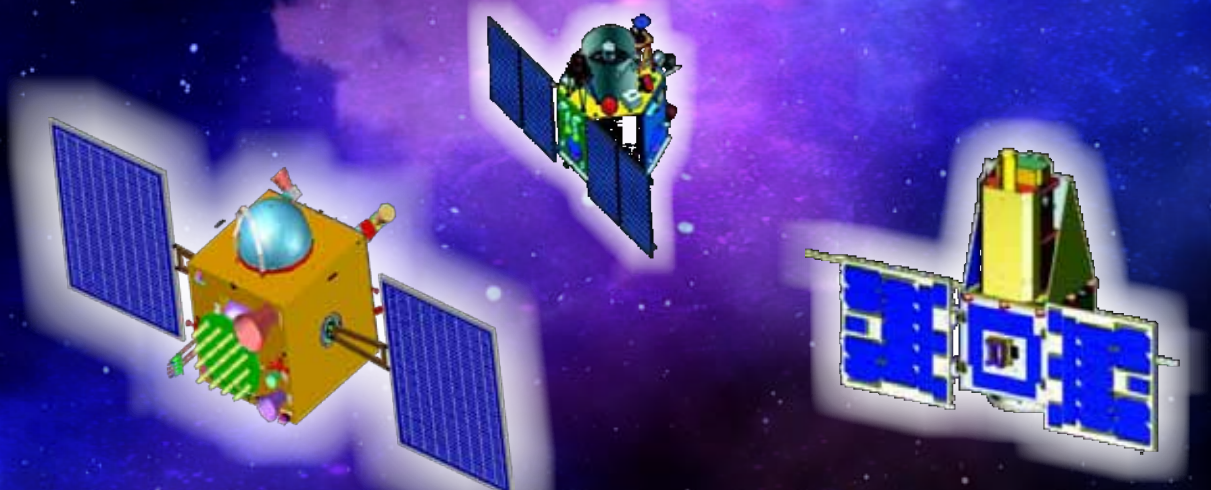

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Israel Aerospace Industries: Its's Variety of Systems

Israel Aerospace Industries (IAI) expects to expand collaboration with local leaders in integrating strategic state-of-the-art systems for the Indian MOD in a number of areas and in accordance with the Indian Government's "Make in India" policy. These collaborations are a direct continuation of IAI's business deals in India which totaled some $1.9billion in 2018. IAI has been working with India's defence industries and armed forces for the past 27 years under strategic collaboration spanning many fields. The Company collaborates with local companies and works with India's defence agencies, as well as with the Navy, Air Force, Army and Coast Guard. Joint development projects include the MRSAM Air defence system, in both its maritime and land-based versions; mission aircraft; various radar systems and UAVs. Collaboration agreements are based on transfer of technology for the benefit of local production as part of the Indian Government's "Make in India" policy.

Nimrod Shefer, IAI's President and CEO

Nimrod Shefer, IAI's President and CEO, stated, "India is one of IAI's main partners. This important partnership is characterised by long-term collaborations, joint development and production, technology transfer and technical support over many years. We are working to nurture this relationship in the future despite growing competition. The excellent reputation that IAI has earned among its Indian partners is vitally important to continuing this tradition of successful cooperation."

At Aero India 2019, IAI is presenting a wide variety of strategic defence systems with an emphasis on MRSAM, TecSar Satellite, TopGun, in the loitering-munition category, featuring the Green Dragon, Mini Harpy and Rotem. Moreover, in the Unmanned Aerial Systems area IAI is displaying the Heron TP and the Bird Eye 650D, which enable a broad range of intelligence gathering capabilities for various operations and NRUAV. IAI is also exhibiting strategic radar systems, satellite communication systems, new electro-optical systems using the new Ultra-POP high definition technology. Additional developments on display include modular and compact command and surveillance systems with stabilised gyros for nighttime and daytime observation at a competitive prices. In addition, IAI is presenting a selection of mission aircraft for intelligence missions, aerial control and naval surveillance on different platforms, such as AEW&C (Airborne Early Warning and Control), ELW 2090, ISTAR and ASIS mission aircraft.

ELW-2090 (AWACS) (Credit: IAI)

IAI's Heron TP (Credit: IDF Spokesperson)

IAI's MRSAM

US/India FMS for Boeing 777 Large Aircraft Infrared Countermeasures SPS

The US State Department has made "a determination" approving a possible Foreign Military Sale to India of two Boeing 777 Large Aircraft Infrared Countermeasures (LAIRCM) Self-Protection Suites (SPS) for an estimated cost of $190 million. The Defense Security Cooperation Agency has delivered the required certification notifying Congress of this possible sale.

The Government of India requested to buy two Self-Protection Suites (SPS) consisting of AN/AAQ 24(V)N Large Aircraft Infrared Countermeasures (LAIRCM), ALQ-211(V)8 Advanced Integrated Defensive Electronic Warfare Suite (AIDEWS), and AN/ALE-47 Counter-Measures Dispensing System (CMDS) to protect two Boeing-777 Head-of-State aircraft. This potential sale would include: twelve Guardian Laser Transmitter Assemblies AN/AAQ-24 (V)N (6 installed and 6 spares); eight LAIRCM System Processor Replacements (LSPR) AN/AAQ-24 (V)N (2 installed and 6 spares); twenty-three Missile Warning Sensors (MWS) for AN/AAQ-24 (V)N (12 installed and 11 spares); five AN/ALE-47 Counter-Measures Dispensing System (CMDS) (2 installed and 3 spares). Also included in this sale are Advanced Integrated Defensive Electronic Warfare Suites (AIDEWS), LAIRCM CIURs, SCAs, HCCs, and UDM cards, initial spares, consumables, repair and return support, support equipment, Self-Protection Suite (SPS) engineering design, integration, hardware integration, flight test and certification, selective availability anti-spoofing modules (SAASM), warranties, publications and technical documentation, training and training equipment, field service representatives; US Government and contractor engineering, technical and logistics support services, and other related elements of logistical and program support. The total estimated cost is $190 million.

Rafael SPIKE NLOS launched from a light buggy

Rafael Advanced Defense Systems Ltd. has released a video from a firing test of the SPIKE NLOS launched from a light buggy (TOMCAR). SPIKE NLOS is a 30 km Precision Guided Missile, part of the 5th generation electro-optical SPIKE Family, operational today in 31 countries worldwide. Last year, RAFAEL unveiled a light, modular launcher for the SPIKE NLOS missile, integrated on a light buggy (e.g. Tomcar).

The SPIKE Launcher used in this test weighs only 1350 kg, including 8 rounds - providing armies and Special Forces with a low-weight, maneuverable, precision element that can be easily air-deployed deep into enemy territory and used to attack point targets (static and mobile) with very high precision, and with no dependence on GPS. The video, which was taken during the launcher qualification process, shows the firing of the SPIKE NLOS missile to above 25 km at various target types and various firing trajectories (both very low and very high) – defined according to the mission, scenario, and target type.

"This new launcher will enhance ground forces' precise stand-off capabilities for low-signature operations in a variety of operational scenarios and requirements. Rafael continues to develop advanced, tailor-made solutions to afford forces increased maneuverability and effective fire-power to overcome battlefield challenges and achieve optimal mission results", stated Zvi M. Head of Rafael's Tactical, Precision Weapon Systems Directorate.

Dassault Aviation's First Rafale delivery to Qatar

On 6 February 2019, a ceremony hosted by Eric Trappier, Dassault Aviation Chairman and Chief Executive Officer was held at Merignac for delivery of the first Rafale to the Qatari Emiri Air Force, under the patronage of Dr Khalid bin Mohamed Al Attiyah, Qatari Deputy Prime Minister and Minister of State for Defense Affairs, and Geneviève Darrieussecq, French State Secretary to the Minister of Armed Forces, and in the presence of Qatar Emiri Air Force Commander, Major General Mubarak Al Khayareen.

This first Rafale delivery, on schedule, comes after the signature in May 2015 of the contract for the acquisition by the State of Qatar of 24 Rafales to equip its Air Force, plus an additional 12, in December 2017, for a total of 36 aircraft to fly under Qatari colours. In the frame of this contract, Qatari pilots as well as technicians are being trained in France both by the French Air Force and the French Industry.

"For the fourth time in our long and trustful partnership with Qatar, a Dassault Aviation aircraft will serve proudly in the Qatari Emiri Air Force. This first delivery is the culmination of a relationship started more than 40 years ago and I am very pleased and grateful that once again the State of Qatar, has renewed its confidence in our dedication and confirmed not once, but twice, the choice of the Rafale to protect its land and people", stated Eric Trappier, Chairman and CEO of Dassault Aviation.

Airbus and Dassault Aviation sign JCS for Future Combat Air System

France and Germany have awarded the first-ever contract – a Joint Concept Study (JCS) – to Dassault Aviation and Airbus for the Future Combat Air System (FCAS) programme.

The launch of the JCS was announced by the French Minister of the Armed Forces, Florence Parly, and her German counterpart, Ursula von der Leyen, at a recent meeting in Paris. The decision by both countries represents a milestone to secure European sovereignty and technological leadership in the military aviation sector for the coming decades.

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The Aeronautics Orbiter 4: a multi-mission platform

The Aeronautics Orbiter 4 is an advanced UAV with ability to carry and operate two different payloads simultaneously developed by Aeronautics, a leading manufacturer of Unmanned Aerial Vehicle (UAV), an Israeli public listed company, and a key player in the defence domain. With an open architecture, the Orbiter 4 can be specially adjusted to the needs of each mission. Among the different payloads, the Orbiter 4 can carry are Maritime patrol radar (MPR), cellular interception sensor, satellite communication, Synthetic Aperture Radar (SAR), Automatic Identification System (AIS) and advanced electro-optic payload. Orbiter 4 capabilities include maximum endurance of up to 24 hours, maximum take-off weight of 50 kgs and maximum flight altitude of 18,000 feet while operating different payloads.

With low logistical footprint and small crew of three personnel, the runway-free Orbiter 4 suits all operational needs. It is built on the successful system design of the Orbiter 3 STUAS, with its advanced avionics, communications and ground control features and applications.

The Orbiter 4 is also equipped with applications such as land and maritime ISTAR, artillery fire management and BDA, target acquisition for precision-guided weapons, Communications Intelligence (COMINT) along with deep sea and coastal reconnaissance, Exclusive Economic Zone (EEZ) security, ship self-defence, offshore facilities security, gun fire direction and BDA.

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The Javelin's Versatility

First deployed in 1996, Javelin is the world's most versatile and lethal one-man-portable and platform-employed anti-tank and multi-target precision weapon system, and more than 45,000 missiles and 12,000 Command Launch Units (CLUs) have been produced. The Javelin weapon system has experienced numerous technology insertions since its initial fielding to stay ahead of advancing threats. The Javelin, which is produced by a joint venture between Raytheon and Lockheed Martin, has been used extensively and to great advantage in combat operations in both Afghanistan and Iraq with over 5,000 engagements conducted by US and coalition forces.

The Javelin continues to evolve as the world's most versatile and lethal close-combat weapon system, thus shoulder-fired anti-tank missile advancing to become platform mounted capabilities, offering the warfighter a highly mobile, combat-proven weapon.

Platform deployment applies to a wide variety of ground, air and maritime platforms, for this use, the standard (unmodified) configuration round is integrated onto a Remote Weapons Station (RWS) or manned/unmanned turret using a modest integration kit. The kit consists of an electronics interface unit, cables and mechanical fixturing. Standard RWS and vehicle/platform sensors, displays, controls and power sources are used for system support.

The Javelin has been integrated onto numerous platforms and vehicles for demonstration/testing and is in service on several platforms and tactical ground vehicles with US and allied forces. Vehicle use includes the U.S. Army Stryker Brigades.

The Javelin will remain in the US Government inventory until 2050 and is currently undergoing spiral upgrades to reduce weight and cost while improving performance. Javelin›s field ready capability has been well documented and demonstrated over many years of combat operations. Javelin has maintained an extremely high operational readiness rate and engagement success rate over a wide variety of operational environments, which include operations at high and low altitude, as well as extreme adverse weather conditions.

Selection of Javelin will provide the Indian Armed Forces with a highly versatile and capable anti-tank weapon system that is interoperable with US and 18 allied forces even as the Javelin will continue to be upgraded over its remaining service life to remain relevant against emerging threats.

The maritime Heron

IAI presents new Anti-Submarine Capabilities for RPAs

Israel Aerospace Industries (IAI) is upgrading capabilities for the maritime arena with anti-submarine capabilities in its marine Remotely Piloted Air Systems (RPAS). The new capabilities respond to the need arising from the discontinuation of the 'Shahaf' manned Sea Scan maritime jet by the Israeli Navy and the growing use of IAI Heron RPAS for maritime patrol missions, which created a need in anti-submarine capabilities launched directly from the RPA. The maritime RPA, which carries a range of dedicated payloads, has two new payloads for submarine detection: the Sonobuoy (acoustic detector) and the MAD (Magnetic Detector).

The Sonobuoy is a small, lightweight innovative sonar float which is ejected from the RPA with a parachute. Part of the Sonobuoy submerges in water and part remains above water, emitting and receiving acoustics signals in high seas. The findings are transmitted real-time to the RPA's control post. The MAD is a RPA-mounted device that detects and alerts on submarines through identification of changes in the magnetic flow (metal objects detection). The two detectors complement one another: the Sonobuoy is used for searching a broad areas while the MAD is used to verify that the object is a submarine, including an up-to-date location. The RPA carries several Sonobuoys, which it hurls accurately into the sea whenever the presence of a submarine is suspected.

The use of RPA-mounted anti-submarine means offers significant advantages, including longer stay time (scores of hours in air), back-transmission of the sonar for many hours, operators who are located on land and can monitor the situation over multiple shift, and most importantly, the absence of risk to human life.

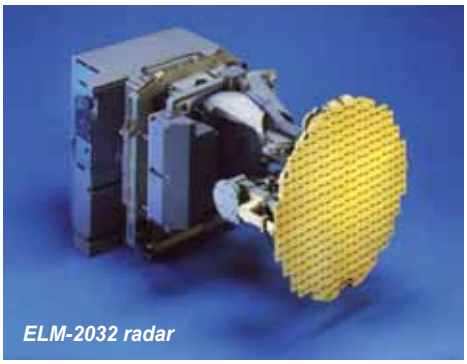
Moshe Levi, IAI executive vice president and general manager of the military aircraft group, commented, "The maritime Heron RPA has proved its efficacy for the Israeli Navy as well as for other clients. The addition of anti-submarine capabilities expands the RPA's operational scope, while opening up new markets for IAI. As the home of the world's advanced technologies, IAI is proud to become one of the first to offer a solution of this type. In an age with growing submarine threats, the use of these systems will improve nations' security across the seas, including in their economic water and seaports."

IAI Ltd. is Israel's largest aerospace and defence company and a globally recognised technology and innovation leader, specialising in developing and manufacturing advanced, state-of-the-art systems for air, space, sea, land, cyber and homeland security. Since 1953, the company has provided advanced technology solutions to government and commercial customers worldwide including: satellites, missiles, weapon systems and munitions, unmanned and robotic systems, radars, C4ISR and more. IAI also designs and manufactures business jets and aerostructures, performs overhaul and maintenance on commercial aircraft and converts passenger aircraft to refueling and cargo configurations.

IAI's ELTA Systems contract for fire-control radars in Asian fighters

ELTA Systems, a division and subsidiary of Israel Aerospace Industries (IAI), has been awarded a $55-million contract for the provision of Multimode Airborne ELM-2032 Fire Control Radars to be installed on newly produced advanced combat aircraft. The radar offers a broad range of operational modes, including high-resolution mapping in SAR mode, detection, tracking, and imaging of aircraft, moving ground and sea targets. The contract is a repeat order, "reflecting the customer's high satisfaction with the radar and ELTA." The radar can be installed on a variety of airborne fighters and is operational in many countries worldwide.

Yoav Turgeman, IAI VP and CEO of ELTA



ELM-2032 radar

Yoav Turgeman, IAI VP and CEO of ELTA stated, "The Multimode ELM-2032 Airborne Fire Control Radars is a versatile radar and addresses several mission types in a single product. Its field of regard, long detection range and accurate tracking provides the pilots with full situation awareness, and its accurate information is used by the aircraft's systems. We are excited about winning this contract, and are grateful that our customers consider ELTA's radars as best in its class."

Lohia Group enters the Aerospace and Defence sector

The Lohia Group has marked its entry into the aerospace and defence sector with the acquisition of Israel-based Light & Strong Limited. Specialising in aerospace and military carbon fibre and glass fibre composite components production, the firm's "established pedigree in military technology manufacturing is a synergistic fit with Lohia Group's decades long expertise in large scale manufacturing across sectors."

The acquisition establishes Lohia Group as a key participant in the sector as it leverages Light & Strong's existing client base, which includes the Israeli Ministry of Defence among others, to build its own presence. The Israeli facility is a well-established aerostructures manufacturer for platforms such as Unmanned Aerial Vehicles (UAVs) and passenger and cargo aircraft. These customers will now be ably supported by Lohia Group with its facilities in Israel and India.

Based in Kanpur, Lohia Group's India facilities will be part of the Uttar Pradesh government's new defence corridor, bringing in high-end key technologies into aerospace and defence composites domain. Working with the Government of India's *Skill India* and *Make in India* initiatives, with this acquisition, "Lohia Group will establish India as an exporter of customised composite products to global OEMs. They aim to become a successful vehicle for executing offset obligations of global companies through this endeavor. The Group will also explore other opportunities in the sector which align with their experience and expertise."

Mr. Anurag Lohia, Director - Lohia Group, stated, "Our acquisition of Light & Strong allows us to integrate our manufacturing expertise with cutting edge technology to help make India the exporter of choice for global OEMs. With our belief in *Make in India*, we are committed to supporting our indigenous aerospace and defence sector for its requirements of all things composite."

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France resplendent at Yelahanka

The French Pavilion, coordinated by GIFAS, is showcasing 36 companies here at the Show. The exhibitors on the French Pavilion include ABC - Aérocampus Aquitaine - Aerometals & Alloys - Air Liquide - ASB Group - Aubert & Duval - Axon'Cable - Cimulec - Daher - Dassault Aviation - Dassault Systèmes - Draka Fileca - First Schwitchtech - Gaches Chimie - Hexcel - Interface Concept - Lauak - LGM - Mach Aéro - Novae Aerospace - NSE - Paris Saint-Denis Aéro - Pinette Emidecau Industries (PEI) - Precicast - Rafale International - Rafaut - Recaero - Roxel - Safran - Saft - Satys - Secan - Sonovision Aetos - Sopra Steria - Thales and the Weare Group.

If the French companies having their own stands are added, then the list further includes Airbus - Liebherr Aeropace - MBDA - Nicomatic India Electronics - Staubli Faverges - Zodiac Data Systems, and those exhibiting under the Indian flag (Alkan / Nucon Aerospace Pvt Ltd - Alten - Assystem - Bolloré Logistics - Lisi Aerospace / Ankit - Radiall - Titeflex), France has the strongest foreign showing by numbers of exhibiting companies, with 49 companies. All sectors are represented and that includes civil and military aerospace, defence and space.

Mr Alexandre Ziegler, Ambassador of France to India, and Lieutenant-General Thierry Carlier, Director for International Development of the Defence Procurement Agency (DGA), representing the Minister for the Armed Forces, visited the show for official meetings with their Indian counterparts and made a point of exchanging views with the GIFAS SME stand personnel on the French Pavilion. Meetings have also been scheduled all week long between the French manufacturers and Indian companies, prime contractors as well as MSMEs.

The Rafale manufactured by Dassault Aviation and deployed by the French Air Force, a Dassault Falcon 2000S, an Airbus A330-900, an Airbus C295 and Airbus H135 and H145 helicopters are all there. It should be noted that some fifteen GIFAS member groups and companies have set up industrial sites in India or have opened sales offices since GIFAS led an outward mission to India in April 2018 to strengthen Franco-Indian aerospace cooperation. GIFAS now has its own office in New Delhi and set up a GIFAS Indian Committee to advise on developing partnerships with Indian industry players.

BEL showcases its wide-ranging capabilities

Bharat Electronics Limited (BEL) are showcasing their state-of-the-art products and systems spanning every domain of its business : Military Communication, Radar Systems, Missile Systems, Naval Systems, C4I Systems, Electronic Warfare Systems, Avionics, Anti-Submarine Warfare Systems, Tank Electronics, Electro Optics, Gun/ Weapon System Upgrades Shelters, Unmanned Systems, Homeland Security, Life Support Systems (Atmospheric Water Generator), Cyber Security and professional electronic components. BEL are also displaying its R&D capabilities by demonstrating some of their new products and technologies.

BEL's radar displays include their Active Electronically Scanned Array Radar, Quick Reaction Surface-to-Air Missile Radar and other state-of-the-art radars for first-round location of artillery weapons (Weapon Locating Radar), border surveillance and detection of low flying targets (BFSR-XR and Aslesha).

BEL's Military Communication displays include Data and Voice communication between systems, Missile Data Link Unit to provide reliable uplink and downlink data from ground station to missile, High Capacity Radio Relay, Software Defined Radio–Airborne, Data Diode used to create a physically secure one-way communication channel from one network to another, Secured Tactical Computer, Rugged Panel-PC, Data Link Radio Frequency Unit for exchanging information at a much higher data rate and indigenised Ku Band Satcom for wideband Satellite Communications from vehicles in motion over rugged terrain.

BEL Software Defined Radio Manpack

Electronic Warfare and avionic products include Head Up Displays for the LCA, IFF for aircraft and helicopters, Drone Interception & Countermeasure System, Satellite AIT, EW Suite for fighters, Self-Protection Suite for helicopters, Data Link for onboard communication on aircraft, VSAT Monitoring System, Aerostat: Aerostat Balloon and Ground Control Station, LRUs for UAV, various avionic and flight control systems for the LCA and Directed Infrared Counter Measure to intercept and counter threats.

Network Centric solutions on display include C4I systems for the Army, Navy and Air Force, Compact Sensor Integration System to enable Command Centre to integrate with variety of sensors and weapon systems, Scrambler Unit, Radio Interface Unit, Integrated VoIP System Suite for seamless voice and video connectivity for ground-to-ground and ground-to-air communication, Image Analytic Engine, Integrated Data Centre, Air Traffic Management and mobile application for secure communication.

Also on display are the complete range of Electro Optics, including EO solutions and Laser Range Finders such as Electro Optics for Coastal Surveillance, Pan & Tilt – Electro Optical Director for long range surveillance applications like coastal surveillance, border surveillance etc, Multipurpose Reflex Weapon Sight, LRF Eye Safe-10 PPM, Hand Held Laser Range Finder and LRF Module.

BFSR-XR Radar

As for its Naval Systems capability, BEL are displaying their Coastal Situational Awareness Radar, Diver Detection Sonar and Low Frequency Dunking Sonar. Components/ Technology modules on display will include ZnS Dome for missiles, TR modules for Radar application, Batteries, Electronic Fuses for Artillery, and others.

Other innovative solutions on display are Data Radio for Distributed Power Wireless Control System, Real-Time Train Information System, Air Borne Server, Record Replay Operator System, Image Analytic Engine, Linear Variable Differential Transducer, Comprehensive Integrated Border Management System, Smart City solutions, Atmospheric Water Generator(AWG), Mine Field Recording System, Chemical Agent Monitor, etc. Model of the L70 upgraded Air Defence gun is also at the exhibition.

Highlight of BEL's outdoor display is the Comprehensive Integrated Border Management System, X Band Active Phase Array Radar, Advance Landing Ground Communication Terminal, Gun Shot Detection System, enclosures made from Composite, Atmospheric Water Generator (AWG), Compact Multipurpose Advance Stabilised System for day and night surveillance, reconnaissance and target tracking application.

This state-of-art equipment is a force multiplier, to make the "Observe Orient Decide Act" (OODA) cycle seamless and efficient.

Weapon Locating Radar

Wipro supplies to Boeing

Wipro Infrastructure Engineering (WIN) have commenced shipment of parts to Boeing from its plant in Bangalore (Devanahalli). Boeing had contracted Wipro Aerospace to manufacture strut assemblies for the 737MAX and Next-Generation 737 airliners. WIN and Boeing have partnered over the last few years, providing various aerostructures and components for the B-737, B-767 and B-787 Dreamliner programmes through its facility in Israel.

Saab and AAI sign MoU for Improved Air Traffic Management Solutions in India

Saab and the Airports Authority of India (AAI) have signed a Memorandum of Understanding (MoU) to research a pan-Indian Air Traffic Management Automation System for airports under the UDAN Regional Connectivity Scheme. Saab and the Airports Authority of India (AAI) will jointly explore potential avenues for co-operation for Air Traffic Management (ATM) solutions in India. The MoU was signed by Vineet Gulati, Member (ANS) from AAI and Peter Engberg, Head of Traffic Management, Saab Business Area Industrial Products and Services.

Saab's Digital Air Traffic Management Solutions has a robust portfolio ranging from Advanced-Surface Movement Guidance & Control System (A-SMGCS) and Surface Movement Radar (SR- 3), to Remote Towers which can be deployed at all types of airports. ATM solutions from Saab can support both single and multiple runway airfields, as well as remote operations and deployable systems. The MoU with Saab will support AAI's need for ATM solutions and training of its personnel in ATM services.

"We are pleased to announce this cooperation with AAI. Programmes such as UDAN-RCS encourage airlines to fly more routes and promote the development of new airports. Over the last 10 years, Saab has been addressing the need for robust, modern ATM and supplying crucial equipment to the Airports Authority of India. We are present today at 11 airports in India and Saab wants to partner with India to build a pan-India A-SMGCS network," says Ola Rignell, Chairman and Managing Director of Saab India.

Saab ATM solutions are now deployed in Ahmedabad, Amritsar, Guwahati, Jaipur, Lucknow, Chennai, Kolkata, Mumbai, New Delhi, Cochin and Bhubaneshwar. All of these airports have Saab's A-SMGCS software and a combination of other products such as SR-3 and the Multilateration (MLATS) solutions.

In addition, Saab is offering its Remote Tower technology to provide Air Traffic Management solutions in far-flung areas. The Remote Tower product suite includes high-definition and pan-tilt-zoom cameras, surveillance and meteorological sensors, microphones, signal lights and other devices for the safe and efficient management of airport operations.

Raytheon News

Raytheon Support Services for Phalanx

Raytheon Co. of Tucson, Arizona, has been awarded an $81 million cost-plus-fixed-fee modification to exercise an option under previously-awarded contract N00024-17-C-5405 for design agent engineering and technical support services for the Phalanx Close-In Weapon System (CIWS), SeaRAM, and Land-based Phalanx Weapon System.

Raytheon to supply 50 Sentinel A3 Radars

Raytheon Integrated Defense Systems of Fullerton, California, has been awarded a $51,901,116 firm-fixed-price contract for the procurement of 50 Enhanced Sentinel A3 radars and associated spares. Bids were solicited via the internet with one received. Work will be performed in Fullerton, California, with an estimated completion date of December 2022. Fiscal 2018 other procurement, Army funds in the amount of $51,901,116 were obligated at the time of the award.

Raytheon Contract for Land-based Phalanx System

Raytheon Co. Missile Systems, Tucson, Arizona, has been awarded a $205,205,445 cost-plus-fixed-fee contract for land-based Phalanx weapon system. Work locations and funding will be determined with each order, with an estimated completion date of December 2023.

Rosaviatsiya validates Ansat high-altitude operation

Federal Air Transport Agency (Rosaviatsiya) has certified the increase in take-off/landing altitude of the Ansat helicopter to 3,500 m. Major change approval is issued on the basis of trials conducted in summer 2018 at Mount Elbrus.

"The major change approval for increase of take-off and landing altitude of Ansat gives us new opportunities to bring in new customers from countries with such complex terrain. For example, during the South Asian Heli Tour conducted in late 2018 we saw interest from potential helicopter operators in Vietnam, Thailand, Cambodia and Malaysia. We received approximately 30 requests for delivery of Ansat helicopters, and improvement of flight performance will benefit our subsequent customer negotiations", noted Andrey Boginskiy, Director General of Russian Helicopters Holding Company.

Ansat is a light twin-engine utility helicopter serially produced at Kazan Helicopters. As per the type certificate, the helicopter design makes it possible to carry out quick conversion from cargo to passenger version capable to transport up to seven people.

News from Lockheed Martin:

The JSF, THAAD and 'FireHercs'

LM-100j 'FireHerc'

Lockheed Martin has introduced the LM-100J *'FireHercs'* a civil-certified firefighting airtanker variant of the C-130J Super Hercules. Legacy Hercules, Super Hercules and L-100s have flown millions of hours in support of missions for military and civilian operators around the world for over 60 years, which includes supporting firefighting missions over more than four decades.

91 F-35s delivered in 2018

"There is good news for air forces waiting to add the F-35 to their arsenal: This fighter's availability rate has risen sharply in recent years and is projected to rise even further while sustainability costs are reducing. Lockheed Martin has so far delivered 309 F-35s and delivered 91 in 2018."

Increasing the production rate, the company plans to deliver 120 F-35s in 2019 and 145 in 2020. The number is set to increase further to about 160 by 2023. There are currently 12 customers globally on 15 bases. Korea and Turkey will have their first F-35s in 2019.

10th JSF for Australia

The tenth F-35A Joint Strike Fighter to be delivered to the Royal Australian Air Force (RAAF) has recently arrived at US Luke Air Force Base in Arizona, joining Australia's other JSF aircraft on the flightline. Minister for Defence, Christopher Pyne MP and the

Minister for Defence Industry, said the delivery of Australia's tenth JSF was an important milestone in the Australian JSF Project. "Our tenth JSF was delivered to RAAF's No.3 Squadron at Luke AFB following a range of acceptance testing activities authorising delivery," Minister Pyne stated.

300th THAAD Interceptor delivered

Lockheed Martin has delivered the 300th interceptor for the Terminal High Altitude Area Defence (THAAD) system, "the only system in the world designed to intercept threats both inside and outside the atmosphere." Production maturity milestone comes as demand for the company's hit-to-kill missile defence system and interceptors continues to grow. A key element of the Ballistic Missile Defence System (BMDS), THAAD protects America's military, allied forces, citizen population centres and critical infrastructure from short and medium-range ballistic missile attacks.

The MBDA Taurus KEPD 350: Autonomous Capability

The MBDA Taurus KEPD 350 represents an ambitious programme which commenced in 1998 by pooling the industrial capabilities in the field of precision stand-off guided missile systems of LFK-Lenkflugkörpersysteme GmbH (now MBDA Deutschland), near Munich, with those of Bofors in Karlskoga, Sweden. This led to the setting up of a joint venture company, TAURUS Systems GmbH, based in Schrobenhausen, Germany, responsible for the development, production, marketing and logistical support of the Taurus stand-off weapon system. The Taurus KEPD 350 (Kinetic Energy Penetration Destroyer) weapon system is a modular cruise missile type weapon initially developed for the German Air Force Tornado IDS strike fighters, yet can also be adapted for F/A-18, Rafale, Gripen and Eurofighter Typhoon. Taurus KEPD 350 also had an extremely short development time, which began in 1998 and completed final testing in March 2004 and officially entered the German Air Force service with the 33 Strike Wing on 21 December 2005.

Five metres long, 1,400 kg KEPD 350 has a range beyond 100 km and is equipped with the MEPHISTO tandem penetration warhead which can effectively engage stationary fortified targets such as underground bunkers and shelters whilst avoiding collateral damage. MEPHISTO is based on a large tandem warhead concept comprising a precursor/shaped charge and a high explosive filled kinetic energy penetrator. To trigger the penetrator charge in order to achieve optimum damage, Taurus uses the world's first smart active decision-making hard target fuse, the Programmable Intelligent Multi-Purpose Fuse (PIMPF). Its shock sensor and intelligent signal-processing algorithm determines impacts and exits of hard layers and thus detects and counts layers and voids. Reliable autonomous navigation is provided by fusion of sensor data from three sensors and includes Image Based Navigation (IBN), Terrain Reference Navigation (TRN) and MIL-GPS subsystems, as the use of such fusion enables the Taurus KEPD 350 to navigate over long distances without GPS support.

The mission planning system supports planning and preparation of terrain-hugging flight paths at high subsonic speeds and terminal targeting in order to penetrate enemy air defences, loaded into the weapon by the ground loader Unit. As with MBDA SCALP/Storm Shadow, during terminal phase in combination with passive high resolution Imaging Infra-Red (IIR) sensors with Autonomous Target Recognition (ATR) system with highly sophisticated line extraction algorithm, the missile retains considerable autonomous operations capability over long ranges. As a future enhancement the use of a data link is examined for confirmation of a correctly performed mission and partial BDA.

Sayan Majumdar

Thales TALIOS optronic pod qualified by French DGA

Combining reconnaissance and targeting capability with visibility of the entire critical decision chain, from gathering intelligence to neutralising threats, is a key requirement for armed forces around the world. Building on 40 years of experience in reconnaissance and identification systems, Thales has developed the TALIOS optronic pod to meet this challenge. The Initial Operational Capability (IOC) version of the new pod has now successfully completed qualification testing by the French defence procurement agency (DGA).

TALIOS combines the latest generation of high-resolution electro-optical and infrared sensors with line-of-sight stabilisation and outstanding image processing capabilities. In addition to its unprecedented target identification performance, the new pod provides long-range threat engagement capability to counter fixed and moving targets.

The TALIOS optronic targeting pod is one of the major components of the new Rafale F3R standard for the French Air Force and French Navy. Deliveries of the first series-produced TALIOS systems to the French forces are in progress and TALIOS is also compatible with other combat aircraft types. Ongoing system developments include an advanced ISR (Intelligence, Surveillance, Reconnaissance) function incorporating new reconnaissance modes and advanced target detection and automatic recognition algorithms. Artificial intelligence will help humans and machines to interact more constructively, but it must never undermine or replace people, who need to be able to take conscious actions at every decisive moment. Other new functions that will contribute to this constructive interaction include high-definition full-colour imagery and the pod's Vision Permanent function, which will superimpose real-time imagery on a 3D map of the operational environment.

Rosoboronexport : record results in 2018

On 4 November 2018, Rosoboronexport, part of the Rostec State Corporation, celebrated its 18th anniversary. The Company was established in 2000 by decree of President of the Russian Federation. "Over the past 18 years, Rosoboronexport has become a world leader in the supply of weapons and military equipment and has reached record levels. Today, Russia ranks second in the world in scope of military-technical cooperation. The Company's order book is well above $50 billion, while the total value of deliveries has exceeded $150 billion over the years. We continuously improve and offer customers more new models of military equipment, often the best in the world in performance and competitive in terms of price and quality. More than 200 Rosoboronexport employees have been awarded state and departmental awards for their great contribution to the development of military-technical cooperation with foreign countries," stated Rostec's Director General Sergey Chemezov.

In 2018, the Company was actively engaged in efforts to promote new products. Rosoboronexport took part in 22 international exhibitions and forums. The Eurasian Air Show in Antalya, Turkey, the International Far Eastern Maritime Show in Vladivostok and ADAS 2018 in the Philippines were debut exhibitions for the Company. "Despite unprecedented competition, Rosoboronexport continues to strengthen its position in the global market. Just recently, we signed the biggest-ever contract in the company's history to supply India with the S-400 Triumph anti-aircraft missile systems. In 2018, we delivered weapons and military equipment to more than 40 countries. At the same time, over 1,100 contract documents worth about $19 billion were signed. These statistics suggest that the quality of Russian weapons and their proven performance are a determining factor for our partners," stated Rosoboronexport's Director General Alexander Mikheev.

Rosoboronexport continues to expand its range of military products over the years and is actively promoting a number of new military hardware in the world arms market, including the Buk-M3 Viking and Tor-E2 SAM systems, the Sprut-SDM1 light amphibious tank, the ships *Karakurt* and *Sarsar*, Il-78MK-90A aerial tanker and the Il-76MD-90A(E) military transport aircraft.

"Rosoboronexport is the only state-owned arms trade company in the Russian Federation authorised to export the full range of military and dual-purpose products, technologies and services." A subsidiary of the Rostec Corporation, it was founded on 4 November 2000 and now Rosoboronexport has become one of the leading world arms exporters in the international market. Its share in Russia's military exports exceeds 85 percent. Rosoboronexport cooperates with more than 700 enterprises and organisations throughout the Russian defence industrial complex.

"Contract for S-400: biggest-ever deal in company history"

On 5 October 2018 at New Delhi, Rosoboronexport signed a contract to supply India with the S-400 Triumf long-range air defence missile system (ADMS). "The S-400 supply agreement with India is a new landmark in the history of military-technical cooperation between our countries. The deal demonstrates the highest level of trust and understanding between India and Russia. I am sure that this agreement will also be a new impulse for strengthening and deepening our cooperation in the industry," stated the Head of Rostec State Corporation Sergey Chemezov.

"The main advantage of the S-400 is in its versatility. The system is able to engage all types of aerodynamic targets and ballistic missiles, including intermediate-range ballistic missiles. The Triumf is far superior to its foreign counterparts in maximum engagement range and minimum engagement altitude, emplacement/displacement time, as well as in a number of other key characteristics. The contract for supply of the S-400 Triumf air defence missile systems to India is the biggest for the entire history of military-technical cooperation between Russia and India and the largest in history of Rosoboronexport. We have now begun to execute it," stated the Head of Rosoboronexport, Alexander Mikheev.

Safran as partner of Indian Aerospace

Safran is committed to being a full-fledged technology partner in the development of the Indian aerospace industry, mainly as supplier of engines and/or equipment and support services for both airplanes and helicopters. The company is the leading supplier of turbine engines for helicopters deployed by the Indian Armed Forces with more than 1,500 helicopter engines in service.

Safran-HAL, a joint venture with Hindustan Aeronautics Limited (HAL) in Bengaluru produces manufacturing unit of CFM56 and LEAP components for CFM International. In 2010 a facility was opened near the Hyderabad airport by CFM International, the 50/50 joint company between Safran and GE, to provide maintenance training for operators of CFM56 engines. More than 500 maintenance engineers and technicians are trained in this facility every year. In April 2017, Air India and CFM International celebrated the delivery and entry into service of the airline's first LEAP-1A-powered A320neo aircraft. The first aircraft has the distinction of being powered by the 100th LEAP-1A production engine.

Safran is also one of the leading suppliers of wheels and carbon brakes for the Airbus A320 and Boeing 787 commercial jetliners in service in India.

The Shakti / Ardiden 1H1 engine powers the ALH Dhruv helicopter. Certified in 2009, the 1,400 shp engine was co-developed by Safran and HAL and is now built in Bangalore, under the Shakti designation, mainly with Indian-made components.

CFM record 3,337 orders in 2018

Orders for CFM International's two product lines again achieved near-record levels in 2018, with the company booking orders for a total of 3,337 engines, including 126 CFM56 engines (commercial, military and spares) and 3,211 LEAP engines (including commitments and spares). Since receiving the first orders in 2011, CFM has garnered more than 17,275 total LEAP installed and spare engine orders and commitments (excluding options) to date at a value of more than $250 billion US at list prices.

2018 marked the production transition from CFM56 engines to the LEAP product line. CFM delivered 1,044 CFM56 installed, spare, and military engines compared to 1,118 LEAP engines, which is more than double the 2017 rate. As the ramp-up continues, CFM is on track to deliver 1,800+ LEAP engines in 2019 and will reach more than 2,000 engines per year by 2020. "2018 LEAP engine orders were near a record high," stated Gaël Méheust, President and CEO of CFM International. "It is highly gratifying to see the continued confidence our customers have in our products. More importantly, though, the engine has been doing incredibly well in commercial service, surpassing three million flight hours. Every day, the LEAP product is delivering world-class fuel efficiency and utilisation, fulfilling the commitment we made to customers more than a decade ago."

Part-II

VAYU Interview with Col HS Shankar, Founder and Chairman/Managing Director of Alpha Design Technologies

VAYU : Concerning projects on Light Weight Laser Target Designators and Missile Launch Detection System, could you elaborate on your major commitments with the Indian Air Force?

HSS : Three years back, we supplied 60 Low Weight Laser Target Designators (LWPLTD) to the IAF which have has been functioning well. We also have a Contract with the MoD for supply of 113 Laser Target Designators to Army, which will be indigenously manufactured and supplied during 2019-20. The Missile Launch Detection System (MILDS) has been a success story, with more than 370 MILDS indigenously made, supplied and fitted on 69 Cheetah helicopters for their protection from shoulder fired missile. We are been tasked to do the same for Mi-17V5 helicopters.

VAYU : How about your foray with the Indian Navy?

HSS : We have made limited entry with the Navy by offering to them (along with Adani Aerospace & Defence Systems), upgradation for Naval Utility Helicopters (NUH). Our R&D has worked with WESEE on developing Core Module for the Navy's SDR. We have also supplied Night Vision Binoculars, monoculars, reflex Sights, etc. to the Navy and are also working on Indigenous IFF, and our 1 Kw HF Transmitter has been evaluated by the Navy recently.

Vayu : Your forte are supplies to the Army and Para Military Forces. What are the most exciting developments in that area, and your collaboration with DRDO?

HSS : Exciting projects for the Army are based on Thermal Imager based Fire Control Systems for T-72s and BMPs. For the IAF, in addition to upgrading 90 Mi-17 helicopters, ADTL also is working together with CABS (DRDO) in developing Mk XII Interrogator, Transponder and Combined Interrogator in Transponder (CIT) for the Army, Navy and Air Force, co-developing with CAIR and DRDO.

VAYU : Tell us more on the offsets and direct exports. Which are the most innovative avenues and some of the most promising prospects in niche and emerging technologies for global markets?

HSS : We are one of the most successful Offset Partners to many OEMs based in Israel and Russia. We also carry out direct exports for full equipment/systems and also sub-units.

VAYU : What are your new expansion plans including new manufacturing campuses in Karnataka and other states?

HSS : We have 5 acres of land allocated to us in the Aerospace SEZ area (near the Devanahalli Airport). We are constructing a new building with R&D and manufacturing infrastructure and plan promote all our exports – both from ADTL and ELBIT - from our SEZ facility.

VAYU : Please give us some idea of the order book, single most rewarding deals, timeline for induction of your systems in India's defence forces?

HSS : We are fortunate in having a confirmed Order Book (or have become L1 during bid openings at MoD) of Rs 2,400 crore for next few years. These will be introduced into Service during 2019–20 onwards.

VAYU : What international targets have you set your sights on, for now and the future ?

HSS : At present, our exports are some 50% of our total sales. This healthy trend will be maintained and further improved in years to come.

Part II
Boeing and the Indian Armed Forces

Creating Indigenous Aerospace & Defence Manufacturing Capability

Over 160 Indian companies have been supplying parts and assemblies covering aerostructures, wire harness, composites, forgings, avionics mission systems, and ground support equipment for some of Boeing's most advanced defence platforms. Boeing's sourcing from India has quadrupled in the past few years and now stands at $1 billion. As part of this journey, Boeing's joint venture with Tata Advanced Systems Limited, Tata Boeing Aerospace Limited (TBAL) has already begun deliveries of fuselages for the AH-64 Apache, the world's most lethal combat helicopter. The centre is becoming the sole source of the fuselage globally.

Committed to evolving these partnerships and investments further, Boeing is proposing a world class advanced manufacturing facility in India for the F/A-18 Super Hornet with the very latest technologies in place. Furthermore, the Super Hornet is the best aircraft to get to India's Advanced Medium Combat Aircraft (AMCA) programme. Boeing will work closely with India industry to ensure they have the very latest technologies, applying lessons learnt from the current Super Hornet production line.

Supporting Present and Future Fleets

"Boeing believes that its partnership with customers begins with the delivery of platforms. Through cutting-edge services and support packages that harness capabilities from across Boeing, we ensure that our customers receive the best operational capability and mission readiness our platforms can provide."

Boeing remains focused on executing on commitments to customers on schedule and cost. "The Indian Navy and Indian Air Force can be assured of achieving exceptional operational capability and readiness of their P-8I and C-17 fleet. Boeing aircraft have high mission readiness rates of more than 85%. Boeing's investments in services infrastructure, the build-up of local capability and workforce and local partnership models will accelerate our strategy. The P-8 and C-17 have demonstrated an excellent record in supporting the missions they have been deployed for and the forces have expressed satisfaction about their operational readiness."

The C-17 GISP programme has become a model for the future of sustainment. The C-17 Simulator Training Centre, established by Boeing and Mahindra Defence Systems to provide training services to the Indian Air Force, completed over 1700 hours of training for aircrews and loadmasters that operate the C-17 Globemaster III in July 2017. The Centre has maintained a serviceability state of 100 percent. With the induction of the Apache and Chinook, Boeing anticipates additional opportunities in rotorcraft training and support centres.

GA-ASI SeaGuardian : Persistent Maritime ISR

SeaGuardian will be equipped with state-of-the-art sensors with unparalleled ISR capabilities for a wide range of operational and threat environments. Sensors include EO/IR Full Motion Video (FMV), Synthetic Aperture Radar (SAR) imagery and Ground Moving Target Indicator (GMTI) data

SeaGuardian is the maritime version of the MQ-9B SkyGuardian from General Atomics Aeronautical Systems, Inc. (GA-ASI). MQ-9B is the world's most advanced Remotely Piloted Aircraft (RPA) and has been selected as a sole source RPA for the UK Royal Air Force (RAF) as the Protector RG Mk1, as well as for the country of Belgium.

On July 11th, 2018 MQ-9B became the first Medium-altitude, Long-endurance (MALE) RPA system to complete a trans-Atlantic flight when it landed at the RAF Fairford in Gloucestershire, UK. The flight originated from GA-ASI's Flight Test and Training Center in Grand Forks, North Dakota, USA. The entire flight, including landing in Gloucestershire, was conducted utilising beyond-line-of-sight (BLOS) satellite data link from the US

In addition to the UK and the US, countries such as Italy and France have GA-ASI MQ-9A systems in their inventory, and the United Arab Emirates operates the Predator RPA. Spain and the Netherlands have MQ-9 systems on order. Discussions are ongoing with several other countries.

Nine external hardpoints on MQ-9B offer unmatched configurability to meet diverse mission requirements. In the basic Intelligence, Surveillance, and Reconnaissance (ISR) configuration, the standard SeaGuardian is equipped with a high-definition Electro-optical/ Infrared (EO/IR) sensor and a high-performance 360° multi-mode maritime radar to support maritime patrol and surveillance. With a range of 6,000-plus nautical miles, SeaGuardian boasts endurance of more than 40 hours. GA-ASI flew an MQ-9B for 48.2 hours on 2,721 kg of fuel in May 2017. Providing greater endurance at lower operating cost, SeaGuardian is ideally suited to complement manned maritime patrol aircraft in performing wide area maritime surveillance.

SeaGuardian provides state-of-the-art sensors with unparalleled ISR capabilities for a wide range of operational and threat environments. Capable of operating at Beyond Line of Sight (BLOS) ranges at altitudes over 40,000 feet and in inclement weather conditions, the MQ-9B will deliver EO/IR Full Motion Video (FMV), Synthetic Aperture Radar (SAR) imagery, Ground Moving Target Indicator (GMTI) data identifying potential threats in real-time from stand-off ranges without harm to the aircrew. The platform can also be equipped with a multi-mode maritime search radar, an Inverse Synthetic Aperture Radar (ISAR) capability, and an Automatic Identification System (AIS) that provides a true Maritime Wide Area Search (MWAS) and allows for the identification and interdiction of maritime targets. These maritime capabilities are critical to confront the maritime threats prior to them causing harm.

Courtesy: GA-ASI

SeaGuardian is the maritime version of the MQ-9B SkyGuardian from General Atomics Aeronautical Systems, Inc. (GA-ASI)

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Saab at Aero India 2019

L to R: Johan Segertoft (Manager Avionics Platform), Stefan Engstrom (Gripen Marketing Director), Group Captain Sudhir Varma (retd) (Head-Gripen & Air Power Systems), Mats Palmberg (Vice President, Industrial Partnerships, Saab + Head of Gripen India Campaign) and Ola Rignell (Chairman and Managing Director, Saab India Technologies Private Limited) at the Saab seminar held at New Delhi on 14 February 2019.

"Saab is proud to be part of Aero India 2019 where we continue to team up with India for its defence and security needs, and the development of a world-class Indian defence industry. Saab's advanced technology and innovative thinking can deliver the best solutions to India for strong national defence and an independent industrial future. Saab brings ready-for-tomorrow defence and security solutions that are always customised to the needs of India's armed forces. We have a long relationship with the Indian Air Force, HAL and many other public and private sector entities involved in aerospace for India. At Aero India 2019 we are showcasing our latest technologies that are transforming defence and security planning, military deployment, defence economics and future force readiness," stated Ola Rignell, Chairman and Managing Director, Saab India Technologies."

"Aero India 2019 comes as the Indian Air Force evaluates new fighters for its future airpower needs. We are displaying the Gripen E mission simulator which clearly demonstrates how Gripen, the most advanced multi-role fighter aircraft in the world, maximises operational effect in the future battlespace. We are also proud to present a full scale Gripen E along with the game-changing Meteor and the precision attack Taurus KEPD missiles," stated Mats Palmberg, Vice President, Industrial Partnerships, Saab, and Head of Gripen India Campaign.

Future Technology Solutions from BAE Systems

BAE Systems' participation at the 12th edition of the biennial Aero India is anchored in its next generation advanced technology, products and services. On the stand are: information on BAE Systems' participation in Team Tempest, the UK's technology development programme being delivered by the Royal Air Force and industry partners to ensure a future international combat air system is at the very forefront of combat air capability.

Also featured on the Stand is the Eurofighter Typhoon; advanced electronic systems (APKWS laser-guided rocket); augmented reality technology (Striker II head-mounted display (HMD); and the Make-in-India Hawk132, of which 123 are in service with the Indian Air Force and the Indian Navy. The Show follows shortly after the Company has marked several delivery milestones in the US Government's sale of 145 M777 Ultra Lightweight Howitzers (ULH) to the Indian Army.

Nik Khanna, Managing Director, India, commented "We are unveiling some of our finest future-tech solutions to the Indian Armed Forces at Aero India this year. The Show serves as a fertile ground for us to expand our efforts in expanding MSMEs into our global supply chain ecosystem whilst engaging with our key stakeholders, providing both direction and momentum in our plans. Developing an incountry supply chain is key to our India commitment and we are delighted to see this being galvanised through the commencement of the Make-in-India M777 programme."·

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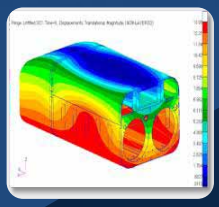


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Finally, an EOI for 111 Naval Utility Helicopters

On 12 February 2019, a week before inaugural of Aero India 2019, the Ministry of Defence issued the Expression of Interest(s) for shortlisting of potential Indian Strategic Partners (SP) and foreign OEMs for the 'Procurement of 111 Naval Utility Helicopters (NUH) for the Indian Navy. These helicopters will replace the obsolescent HAL Chetak helicopters and tasked for SAR, CASEVAC, LIMO, personnel transport as also torpedo launch. The first six helicopters would be procured 'fly away', the balance 95 to be manufactured in India by the selected SP.

The OEMs have been mandated to establish dedicated manufacturing facilities, with design, integration and manufacturing processes for the NUH in India to make this as a "global exclusive facility."

Amongst the Indian Companies shortlisted as potential strategic partners are Tata Advanced Systems, Mahindra Defence, Adani Defence, L&T, Bharat Forge and Reliance Infrastructure. The foreign OEMs likely to participate in the project are Lockheed Martin, Airbus Helicopters, Bell Helicopters and RoE.

Vayu's Show Daily: first on the stands – as always !

On first day of Aero India 2019, the Vayu team distributed the Show Daily right across the Exhibition through all the Halls, Media Centre, Chalets and other places (the inimitable team seen in the image above). The Vayu was most prominent at the inaugural itself, with the 'cover girl' receiving her copy personally after the inaugural speeches, as did all the dignitaries present at the event.

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